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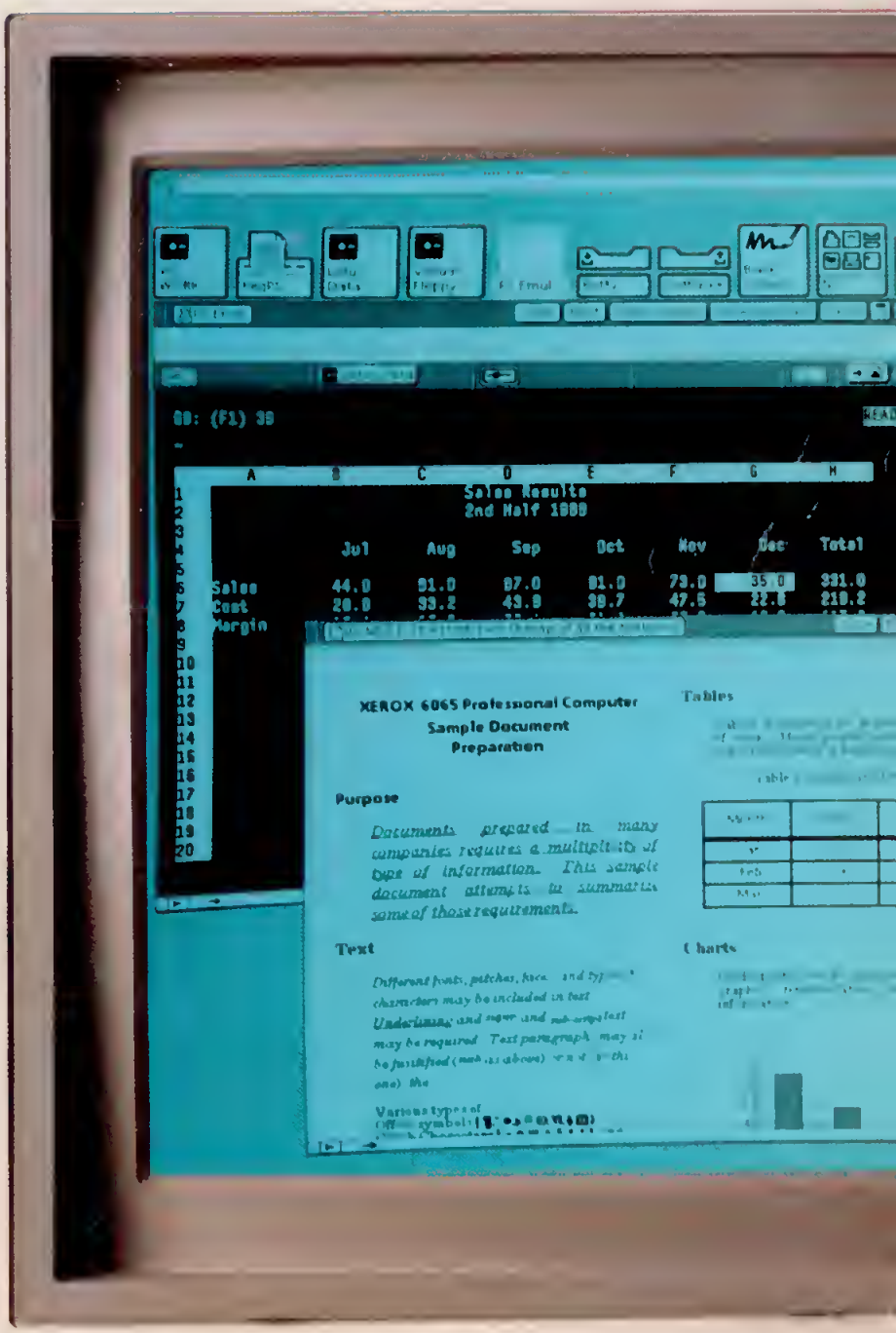
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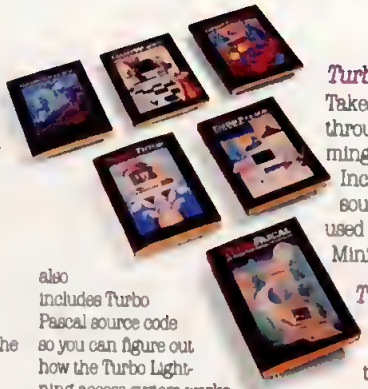
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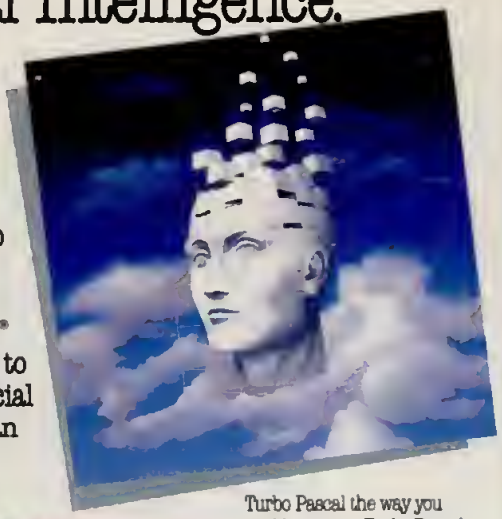
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AP7



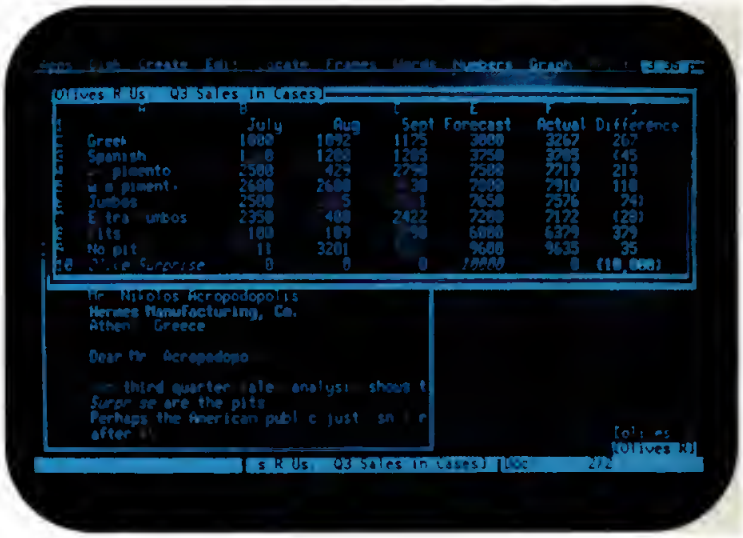
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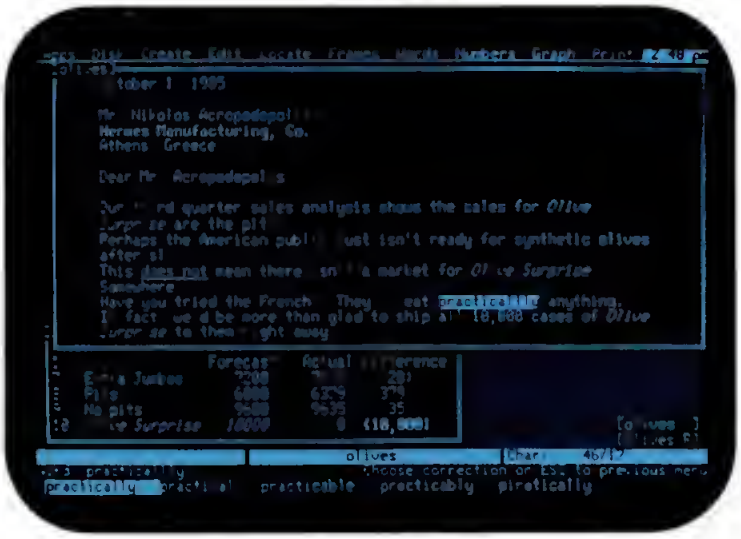
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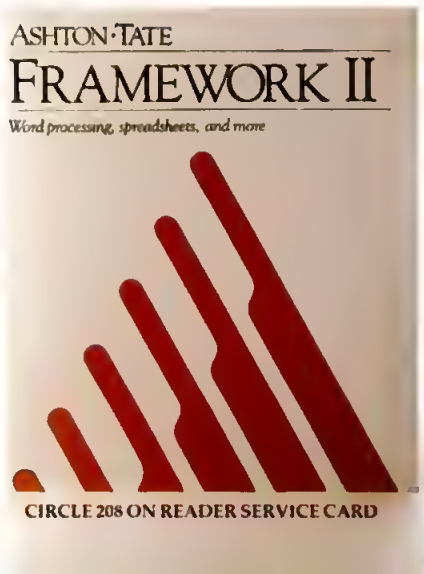


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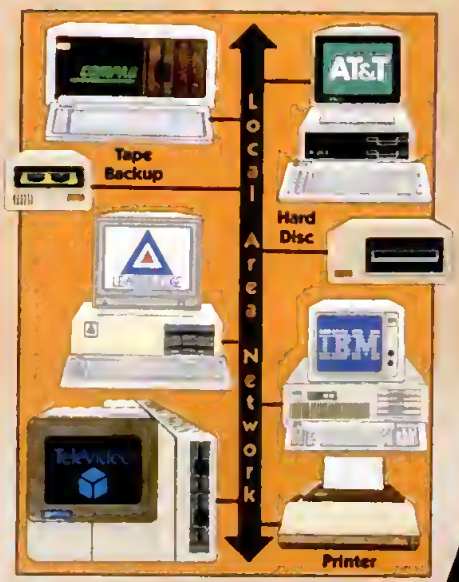
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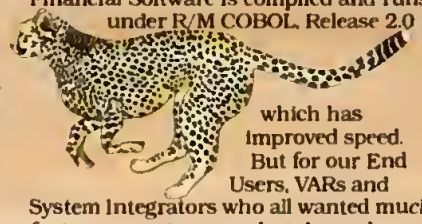
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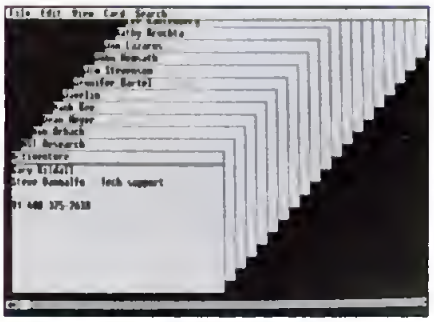
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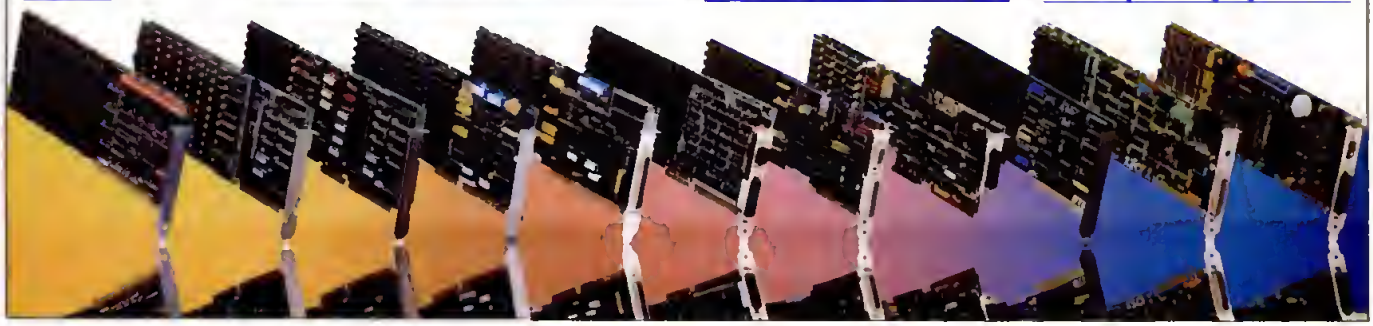
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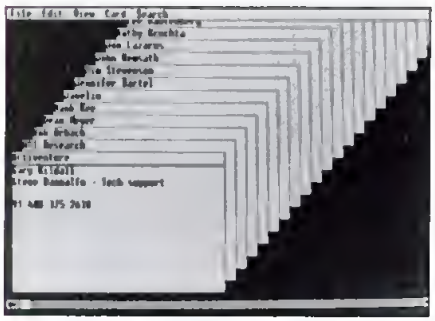
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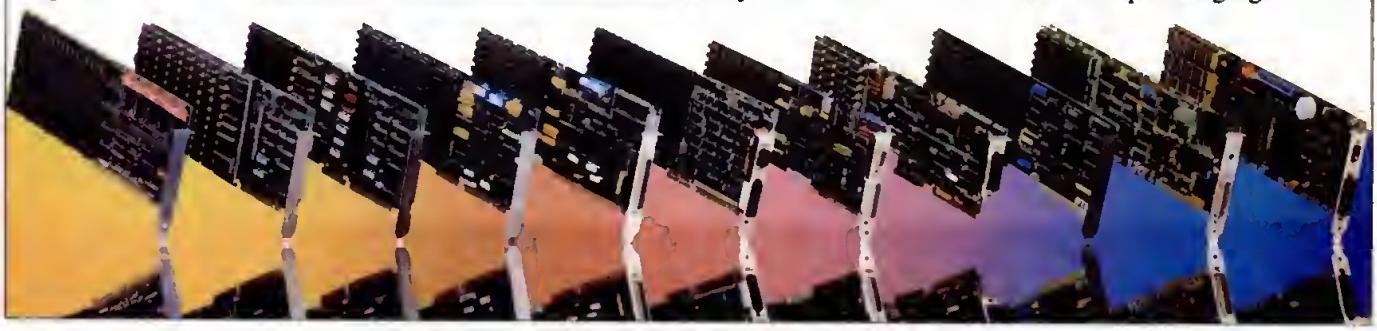
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Introducing our new family of micro tape drives. They put more data on a business-card size tape cartridge than 99% of PC users have on their hard disk—20 megabytes.

One model tucks inside your PC. The other sits next to your monitor, in a sleek "zero-footprint" enclosure.

Both employ BackTrack,™ software that automatically copies your hard disk data onto tape throughout the day. So you're never more than a few minutes away from your most current data.

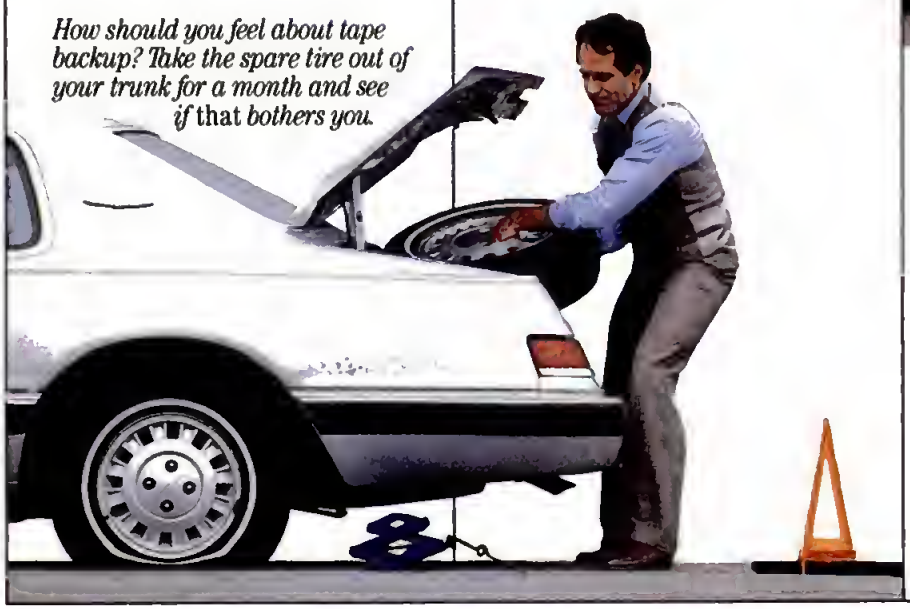
And both are available with a companion 25 megabyte hard disk,



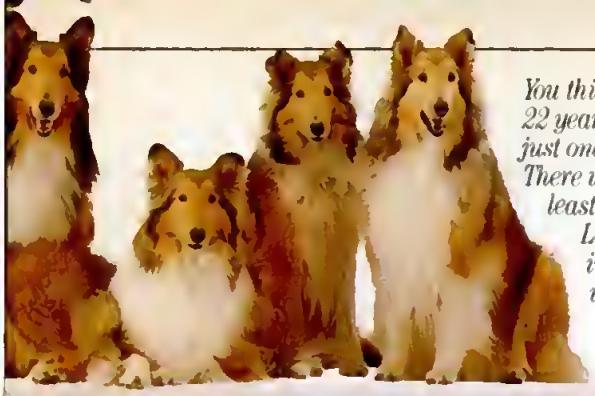
TG-1020i: Half-height internal 20-megabyte tape backup system for PC, XT, AT and compatibles.

TG-2025i: Internal 20-megabyte tape backup system mated with 25-megabyte hard disk for PC, XT and compatibles. Half-height AT&T/Olivetti model available, too.

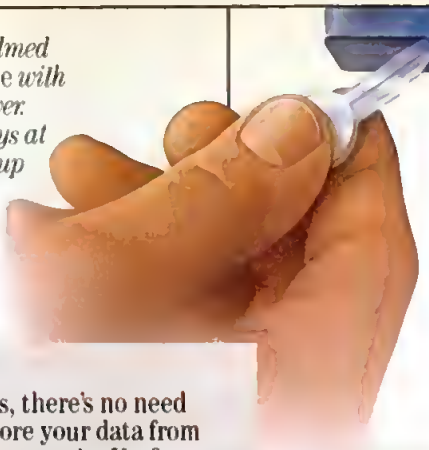
How should you feel about tape backup? Take the spare tire out of your trunk for a month and see if that *bothers you.*



December 30, 1978: Danny White comes in as Quarterbackup when Roger Staubach is knocked unconscious, and leads the Dallas Cowboys to a come-from-behind 27-20 playoff victory over the Atlanta Falcons.



You think they filmed 22 years of Lassie *with just one dog? Never. There were always at least two backup Lassies in the wings.*



If you want to reduce the chances that you'll ever get locked out, just go to the trouble of stashing a backup key.

so you can upgrade your PC and get fail-safe tape backup at the same time.

A big step forward in backup. We've pioneered most of the major technological advances in PC tape backup over the past few years. We've set the standard for professional quality, high-end systems.

Now we've packaged that technology to put it within reach of *all* PC users.

That means we made it affordable. And compact. And, most of all, abundantly easy to understand and use.

So if—make that *when*—Fate Deals a Dirty Blow, and operator error, a sudden power surge or the inevitable mechanical failure of a hard disk leaves you dataless, there's no need to panic. Just restore your data from tape. And in minutes you're Up & Running. Instead of Down & Out.

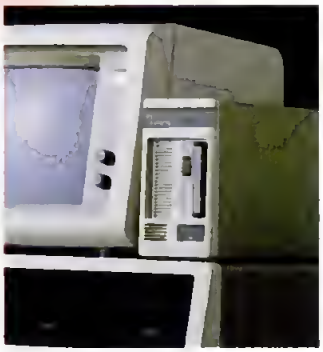
Don't get caught with your backup down.

If you're buying a new system, insist on built-in backup. Before something goes wrong.

If you already have a PC, head back to your dealer and get backup added. Before something goes wrong *again.*

Either way, before you make a move, dial 1/800-228-DISK for the name of the Tallgrass dealer nearest you.

And don't forget to check your spare.



We have a brand new family of micro tape drives, available as internal systems or packaged in a new zero-footprint enclosure.

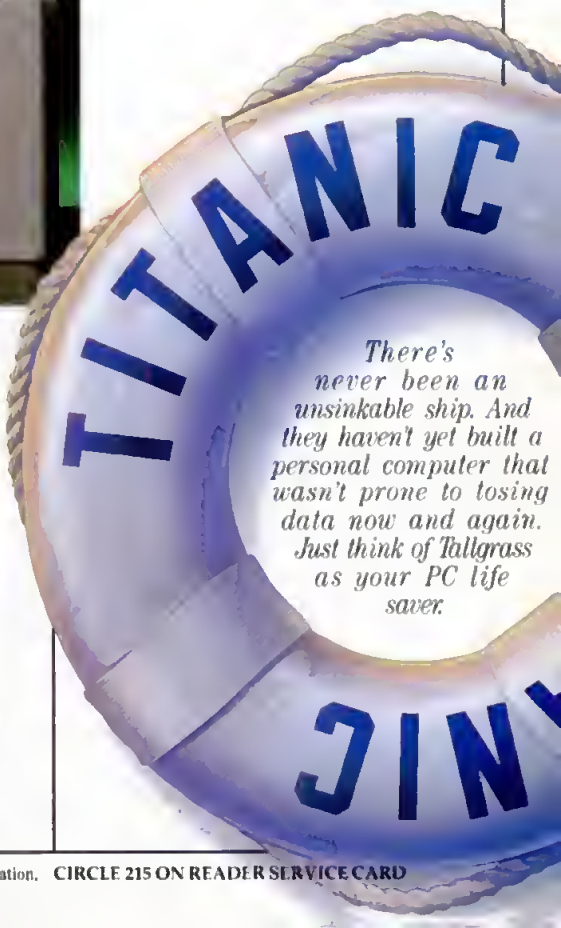


TG-1020e: Stand-alone 20-megabyte tape backup system for PC, XT, AT and compatibles. TG-2025e includes 25 megabyte hard disk.

TG-4060/5025/6135/6150/6180: 60 megabytes of tape, available as stand-alone backup or with 25, 35, 50 or 80 megabyte hard disks.

BackTrack: Makes backup automatic. And even if you aren't ready for Tallgrass tape, BackTrack software provides streamlined backup from hard disks onto floppies.





TALLGRASS TECHNOLOGIES
When It's Worth Saving.

11100 West 82nd St., Overland Park, KS 66214

BackTrack is a trademark of Tallgrass Technologies Corporation. CIRCLE 215 ON READER SERVICE CARD

Nobody licks our Lips.



LIPS 10 is emerging as the champion in Laser Image Printing Systems. As a second-generation printer, it beats all contenders to the punch. In value, as well as in performance.



It gives you a 10 page per minute print speed. That's 25% faster performance than the 8-count of first generation laser printers.

Want endurance? It delivers up to 600,000 pages during its long life cycle — 300,000 more than any challenger. That means, you can count on its low cost of ownership.

LIPS 10 goes the distance. It's made to print 15,000 pages per month, surpassing the 3,000 pages per month of its competitors.

You also get the style you're looking for. A big round of fonts and graphics. And PC software compatibility that lets it take on the most popular systems. Plus, a smart panel that features a 40-character English text LCD display for ease of use.

The LIPS 10 laser printer. Compared to all others, it's clearly the champion.

CIE TERMINALS

WHERE CRAFTSMANSHIP IS STILL A TRADITION.

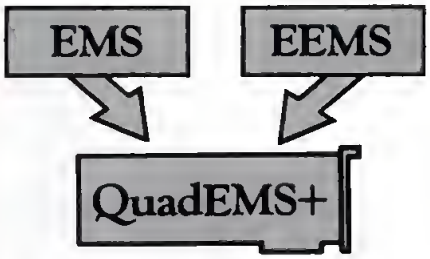
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CIRCLE 280 ON READER SERVICE CARD



QuadEMS+™

The Only Memory Board For Your PC-XT With Both EMS and EEMS.



Memory And I/O

QuadEMS+ delivers 2Mb RAM when you move up to expanded memory. And supports both expanded memory specifications: EMS and EEMS. Each is independently engineered into the board. Plus, there's a printer port, communications port, and clock/calendar to enhance your system.

Memory Only

If all you're after is memory, QuadEMS+ also comes without I/O. Pure RAM. Either way, QuadEMS+ lets your system take advantage of the power of expanded memory without worrying about compatibility problems that might crop up later.

So Smart, It Installs Itself

Available now for your PC-XT and XT work-alikes, QuadEMS+ is easy to use. Just plug it in. It does the rest. It's designed to automatically configure itself to your system requirements. For more information visit the Quadram dealer nearest you. Or contact us at One Quad Way, Norcross, Georgia 30093; 404-564-5566.

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CIRCLE 124 ON READER SERVICE CARD

QUADRAM®
An Intelligent Systems Company



Ven-Tel's Half Card™ modem is in all the best computers. Here's why...

Ven-Tel gives you lots of reasons to buy our Half Card™ modem for your IBM PC or compatible. The Half Card™ is a complete system that lets you communicate with other PCs, mainframes, and databases effortlessly. It includes Crosstalk-XVI® software. It's reliable. It's got all of the features you want. And it's a good value.

Do You Own One of These Computers?

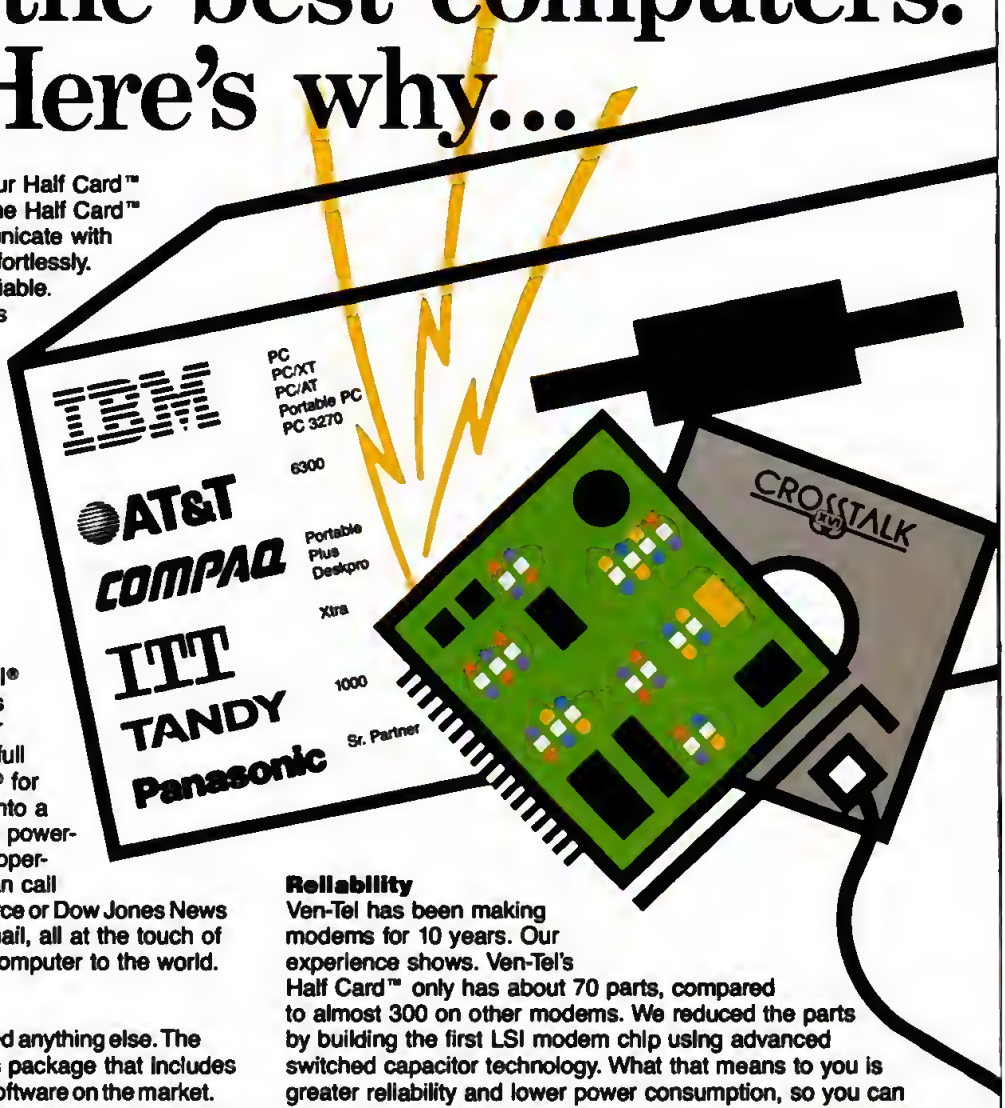
Chances are you do. And if you're thinking of buying a modem, consider the Half Card™. Because of its small size, the Half Card™ fits in more computers, including all of the models we've listed here. The Half Card™ is small, so it fits in short slots or long. That means you can save your long slots for other expansion uses.

Effortless Communication

Each Half Card™ comes with Crosstalk-XVI® communications software, by Microstuf. It's the easiest to use, whether you're a beginner or an old hand, and the most powerful. A full on-line help menu makes using Crosstalk® for the first time a snap. It can turn your PC into a terminal on a mainframe computer with its powerful terminal emulation feature. It will even operate your PC when you're not there. You can call into an information service such as The Source or Dow Jones News Retrieval, or transfer files and electronic mail, all at the touch of a button. The Half Card™ connects your computer to the world. Effortlessly.

More Modem for Your Money

When you buy the Half Card,™ you don't need anything else. The Half Card™ is a complete communications package that includes a full-featured modem and the best known software on the market. Complete easy-to-understand instructions with full technical support on installation and use. And a very competitive price. The Half Card,™ with Crosstalk-XVI® software, retails for only $549.



Reliability

Ven-Tel has been making modems for 10 years. Our experience shows. Ven-Tel's Half Card™ only has about 70 parts, compared to almost 300 on other modems. We reduced the parts by building the first LSI modem chip using advanced switched capacitor technology. What that means to you is greater reliability and lower power consumption, so you can load up your PC with expansion boards and not worry about heat or power problems. And we back the Half Card™ with a full two-year warranty on parts and labor.

Features

- 1200/300 baud auto-dial, auto-answer.
- Uses the industry standard "AT" command set.
- Runs with virtually all communications software, including Smartcom II and PC Talk III and integrated packages such as Symphony and Framework.
- Includes Crosstalk-XVI® software.
- On-board speaker and extra phone jack for easy switching from voice to data mode.
- Selective tone or pulse dialing; full or half duplex.
- Automatic answer on any ring.
- True ring or busy signal detection.



You Can Buy the Half Card™ Anywhere

You can get the Half Card™ at ComputerLand, Businessland, the Genra Group, Entré Computer Centers, Macy's Computer Stores and other fine dealers nationwide. Also from Ven-Tel: the 1200 Plus,™ an external modem and the PC Modem 1200,™ an IBM internal with V.22 international capability.

Effortless Communication

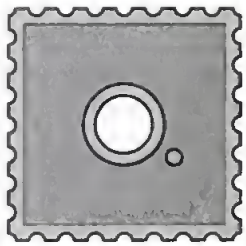
Ven-Tel Inc.

2342 Walsh Avenue
Santa Clara, CA 95051
(408) 727-5721

Crosstalk is a registered trademark of Microstuf, Inc. Smartcom II is a trademark of Hayes Microcomputer Products. Symphony is a trademark of Lotus Development. Framework is a trademark of Ashton-Tate.

CIRCLE 364 ON READER SERVICE CARD

LETTERS TO PC MAGAZINE



SPEED CADET

As a user of *CADVANCE*, I was disappointed by Glenn Hart's review of CalComp's latest contribution to the CAD market (see "Complex CAD: Software for the PC," *PC Magazine*, Volume 5 Number 5). The features that he found "fascinating" or "flexible" turn *CADVANCE* into the fastest PC-based CAD software on the market for two-dimensional drafting associated with building design.



The American Institute of Architects "shootout" gave *CADPLAN* high marks for its usefulness to architects, and *CADVANCE* is at least a generation ahead of *CADPLAN*. Having used similar products in real-world projects where customers depend upon timely results, I can assure you that *CADVANCE* is extremely useful. My experience with technical support has always been first-rate with prompt attention to any problems. Without going into a detailed comparison of CAD packages, I can truly reply yes to your cover question, "Can Anything Beat AutoCAD?"

Bruce Johnson
Sierra Vista, California

LAB NOTES FANS

I have always enjoyed reading *PC Magazine* and will enjoy it all the more with the addition of your new column PC Lab Notes ("DOS Tips, Tricks, and Techniques," Volume 5 Number 6). This is the kind of information most useful to me. Tom Sheldon was correct when he said that many users view DOS as "a freeway on-ramp." Maybe with his help I will start thinking of DOS as part of the freeway itself.

Tom Dawsey
The Colony, Texas

I congratulate *PC Magazine* and Tom Sheldon on PC Lab Notes. That this column falls under "Productivity" is appropriate. Your first feature, "DOS Tips, Tricks, and Techniques" provided me with the tools to make some quick and productive changes to my PC and PC-XT .BAT files. PC Lab Notes is especially helpful to those of us who have gone past the neophyte stage but have neither time nor interest to become programmers.

Thomas R. Thurmond
Vacaville, California

I enjoyed seeing my article "DOS Tips, Tricks, and Techniques" in your new PC Lab Notes column, but I must point out that my tips and tricks book, *Introducing PC DOS: A Guide for Beginning and Advanced Users* (McGraw-Hill), isn't due out in May 1986; it's been on the shelves since June 1985!

Tom Sheldon
Santa Barbara, California

SATISFIED CUSTOMER

I want to thank you for the excellent work you've done in testing hardware and software. As a computer teacher I have to be very careful to purchase quality software because, when the budget is spent, I'll have to live with my choice for a very long time. *WordPerfect*, Version 4.1, is the kind of program that teachers love to teach. It is the most powerful and easiest-to-teach program I have had the pleasure of working with. My students, all professionals in business, absolutely refuse to waste time with inferior or just fair software. They are thrilled though at what Version 4.1 can do for them. My only problem has been getting them to turn off the IBMs so that we can go home at the end of class.

Daniel Crupler
Bradenton, Florida

TIME SAVER

As an investment advisor, I found *PC Magazine*, Volume 5 Number 7, to be extremely informative, especially the article "Rating Investment Software: Technical Analysis." This article saved countless hours of my time investigating the capabilities of certain technical analysis programs.



The cover price of that issue of *PC Magazine* is one of the best investments of the year for me. At my going rate of $120 per hour and the time I saved (I figure at least 40 hours), I can conservatively estimate that the rate of return is 1,627 percent. And if we annualize the rate of return, it becomes astronomical.

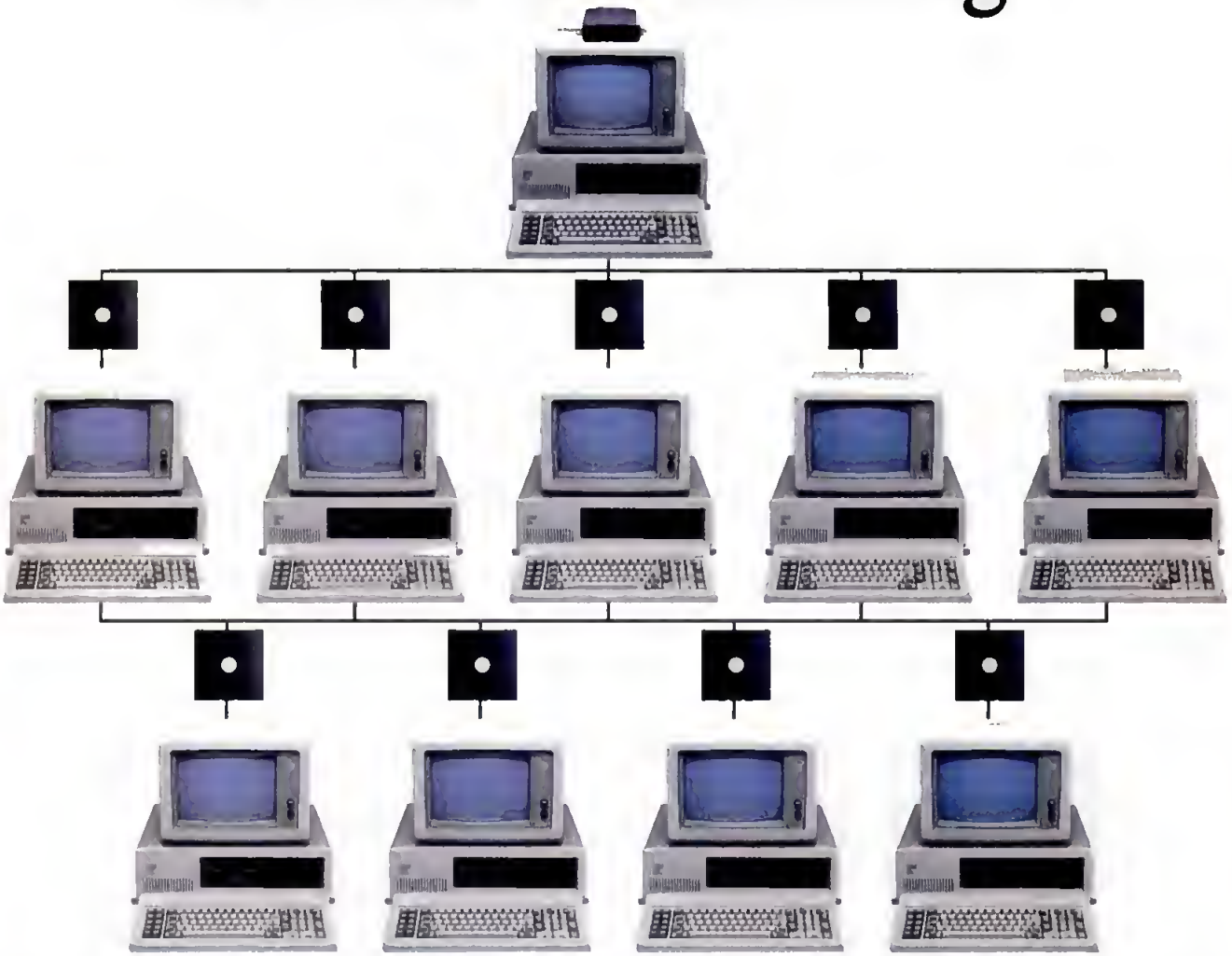
William F. Eng
Chicago, Illinois

WAITING FOR USER VOICES

There are several aspects to software that always seem to get people worked up: copy protection, license agreements, warranties, and customer support.

I have been appointed to a customer advisory committee for the Association of Data Processing Service Organizations, the trade association for the U.S. software

If you can't put a Hayes modem on every PC in your IBM network, here's the next best thing.



© 1986 Hayes Microcomputer Products, Inc.

*Manufacturer's estimated retail price.

It's new communications software from Hayes called Smartcom II® for the PC Network.

It lets you share modems. So even PC's without their own modems can communicate outside the network.

Before now, if you needed to communicate outside the network, you had to physically go to wherever the modem was. That, in turn, meant bumping the operator off his modem-equipped PC, so that you could handle your communications.

Hayes Smartcom II for the PC Network puts an end to all the delay and inconvenience. Now, when a PC needs the modem, the user is automatically connected from his own desk. So communications capabilities are immediately available to everyone on your network, whether their PC has a modem or not.

You only buy one software package per modem. The workstation part of the software can then be duplicated for each PC on the network, at no extra cost. It's better than having a site license!

Each PC can have its own password, define its own log-on procedures, set its own macros, and use all the other outstanding operating features of our standard Smartcom II while connecting with any of the shared modems on the network.

You get all this for only $599*! And it's backed by Hayes, the PC communications leader.

So if you currently utilize, or are contemplating adding, IBM PC networks, you should also add Smartcom II for the PC Network. For efficient communications. Without delay.

See your authorized Hayes dealer for details. Or contact Hayes at 404/441-1617.

Hayes Microcomputer Products, Inc., P.O. Box 105203, Atlanta, Georgia 30348.

Hayes®

Say yes to the future

CIRCLE 165 ON READER SERVICE CARD

Dac-Easy Accounting "Best Software Value"

InfoWorld
1985 "Product of the Year" Awards

InfoWorld 1985 PRODUCT OF THE YEAR

"Trendsetting Accounting Product of the Year"

PC World
December, 1985

100,000 and more every day. That's how many smart buyers have already streamlined their accounting with the fastest-selling, most highly praised accounting package ever introduced.

Dac-Easy offers seven full feature accounting modules in a perfectly integrated package, with instant access to:

- General Ledger
- Accounts Receivable
- Accounts Payable
- Forecasting
- Inventory
- Purchase Order
- Billing

You can generate over 300 reports from 80 different routines. And best of all, Dac-Easy Accounting can be used to manage either service- or product-based businesses.

Now the Dac-Easy Series expands with the addition of the widely acclaimed Dac-Easy Payroll and Dac-Easy Word. Dac-Easy Accounting and Payroll are even more powerful and flexible with the company of Dac-Easy Mate and Dac-Easy Port. Also new for 1986 are Dac-Easy Accounting Tutor and Dac-Easy Payroll Tutor.

The best-selling business solution is now complete. Read what the experts say. Compare power, features, ease of use and price. Then join more than 100,000 people who have said "Yes!" to Dac-Easy.

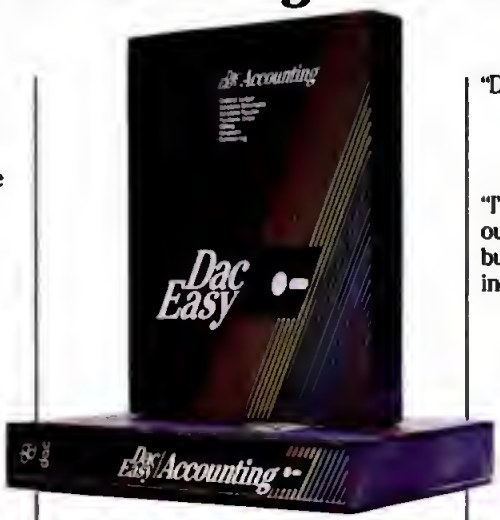
All the Dac-Easy products are non-copy protected, fully documented, and come with a 30-day money back guarantee.

30-day money back guarantee

Dac Software offers an unconditional guarantee on all Dac-Easy products (less shipping charges). There is a $10 restocking fee if the disk seal is broken. This guarantee is available on all products bought directly from Dac Software.

Minimum Hardware Requirements:
IBM or other compatibles. 256K memory, two disk drives, MS-DOS, PC-DOS 2.0 or later, 132 column printer in compressed mode, color or monochrome monitor.

MS-DOS is a trademark of MicroSoft Corp. IBM and PC-DOS 2.0 are registered trademarks of International Business Machines Corp.



$69.95

NEW!

Dac Easy/Payroll $49.95

The best in personnel and payroll processing. Automatic tax calculations for all 50 states. Tremendous report features. Multi-departments, after-the-fact payroll, interfaces with Dac-Easy Accounting or can stand alone.

Dac Easy/Word $49.95

Powerful, easy and flexible. Includes 70,000 word spell checker, mail merge, windows for up to four documents, cut and paste, search, word-breaking, word count, and much more.

Dac Easy/Mate $39.95

The perfect companion to our best-selling accounting and payroll programs. Add the Dac Road Map, calculator, color or intensity selection, macros, print to screen option, and file windowing. Dac-Easy Mate makes your accounting fun.

Dac Easy/Port $29.95

A great program that sends your accounting and payroll files to your favorite spreadsheet. Pick from your customer, vendor, chart of account, inventory, or employee files. Select ranges and select individual fields. Fast, easy operation.

Dac Easy/Accounting Tutor $19.95

Dac Easy/Payroll Tutor $19.95

These two programs make accounting and payroll a snap to learn. Can be used by the beginner or by the current user as a handy, stand-alone supplement to the user's manual

"Dac-Easy is a genuinely amazing deal."
PC Magazine
October 15, 1985
"Editor's Choice"

"I've never before in a review come right out and told readers to buy a product, but I'm doing it now. Dac-Easy is an incredible value."
PC Week
August 27, 1985

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CIRCLE 149 ON READER SERVICE CARD

■ LETTERS

and services industry. This committee will meet several times a year to discuss areas of concern for software customers and to advise the industry about them.

I would be delighted to hear directly from *PC Magazine* readers who have opinions to express or experiences to relate about these topics. They can write to me directly at PC Connection, 6 Mill St., Marlow, NH 03456.

Peter Haas
Marlow, New Hampshire

WORDS INTO TYPE

Since all of your reviews of *Microsoft Word 2.0* have raved about its printer support ("The Business of Words: Professional," *PC Magazine*, Volume 5 Number 2), I was surprised to find that this was the program's worst feature. I have an Okidata Microline 92, hardly a new or rare machine. Yet *Word* could not even produce all the different type sizes and styles the printer was capable of. For example, I could get correspondence-quality printing in pica but not in elite. Furthermore, since *Word* did not use the same names for fonts as the printer manual, I had to run a test of all available font names just to find out what they were.

Even worse, Microsoft clearly didn't put much effort into reading the Okidata manual. One problem arose when I tried to use boldface while in correspondence mode. After exiting boldface, the rest of the line was printed in data mode. The problem was that Okidata uses the same command to turn off both correspondence mode and boldfacing.

Word also doesn't support alternative character sets. What it does do is define characters above ASCII 127 as double-strike characters, and you can use the CONVPRD command to define them any way you want. But the way it produces these characters is to print the first character, backspace, and then print the second. But the Okidata doesn't backspace, so what you get is the two characters in sequence. This could be written off as a limitation of the printer except that *Word* is capable of producing strikeout characters by canceling the line feed and going back over the same line again.

David A. Johns
Gainsville, Florida

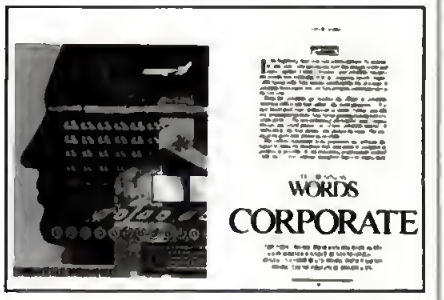
John Dickinson replies:

Perhaps you've noticed that every time Microsoft Word *shows up in* PC Magazine*'s Power User column, the issue discussed and corrected is printer support.* Word*'s printer drivers (.PRD files) are far from perfect, but at least (unlike some word processors)* Word *gives you the ability to correct and/or tailor the drivers to suit your tastes and needs.*

Why don't you send your fixes to Power User and share the details of your improvements with the rest of the world?

WORDS TO STAND BY

Single-category roundups like your recent word processor marathon ("The Business of Words: Corporate," *PC Magazine*,



Volume 5 Number 2) have been a real help to me when I've been shopping for programs or machines in a particular category. Inevitably, there are facts I don't learn until after making the purchase.

For ease of use, I think you're right to tip your hat to *Leading Edge Word Processor*, Version 1.3, but did you notice the size of the files it takes to store those documents*!* They're several times the size of a corresponding ASCII file.

John Spragens, Jr.
Washington, D.C.

REFINED WORDS

I agree with Craig Stinson that *SAMNA Word III*, Version 3.0, is best used with a hard disk because it is so file intensive ("The Business of Words: Corporate," *PC Magazine*, Volume 5 Number 2). But having used it for 9 months (a fair gestation period) on a Compaq Deskpro III, I have to wonder about his cranky annoyance with its "clumsy" human engineering features. If Mr. Stinson ever has his local power grid go down, he won't consider automatic save to be "trashing." File backup is clearly indicated when one installs the program and is also explained in the manual's introduction, under Backup and Files. One can scarcely miss it.

Michael T. Thall
Ann Arbor, Michigan

PRODUCT UPDATES

The price of the CalComp 1043GT pen plotter featured in *PC Magazine* (Hardware: Firm Support for CAD," Volume 5 Number 5) is $8,905. The telephone number to Brainwave Computer Products, makers of the Player Piano PC-mainframe program featured in New on the Market (*PC Magazine*, Volume 5 Number 5), is (714) 969-1327. Sigma Design's SWS-0060, reviewed in "Tape Backup: Measuring Speed and Cost per Megabyte" (*PC Magazine*, Volume 5 Number 3), had an accompanying photo of its one-reel tape instead of the product reviewed.

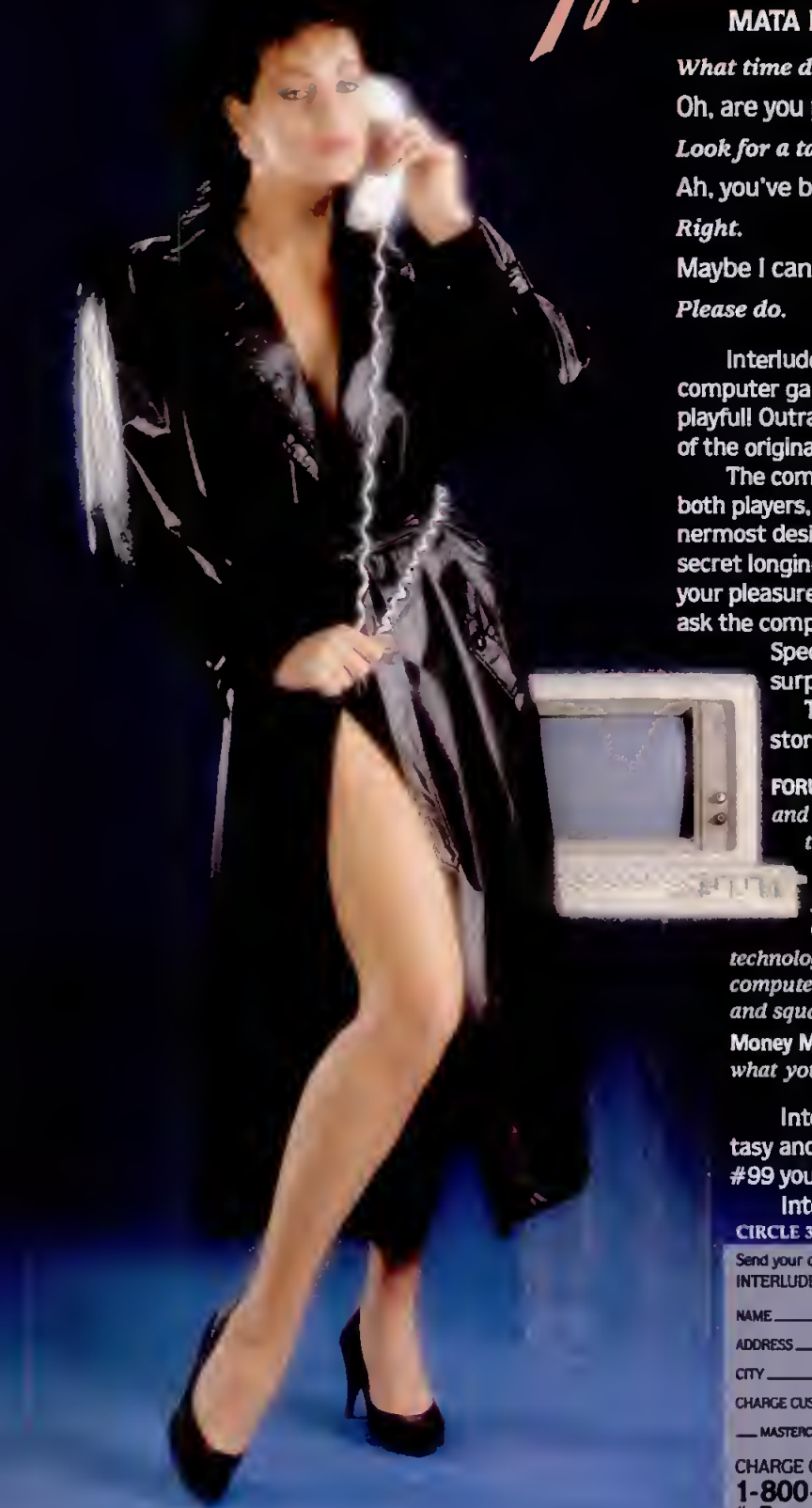
■ If *PC Magazine* author Craig Stinson ever has his local power grid go down, he won't consider automatic save to be "trashing."

HOW TO WRITE TO PC MAGAZINE

Do you have a comment, compliment, or criticism about something you've read in *PC Magazine*? A question you'd like to open up to other readers? Then send your opinion on paper or disk to Letters to PC Magazine, One Park Avenue, New York, NY 10016, or send your opinion through MCI Mail to PCMAGAZINE at address 157-9301. We're sorry we're not able to answer letters personally.

All letters become the property of *PC Magazine* and may be subject to editing. We can't print letters that do not include a name, address, and phone number for verification.

Interlude II



MATA HARI—Interlude #156

What time does your flight arrive?

Oh, are you picking me up?

Look for a tall brunette in a trenchcoat...and nothing else.

Ah, you've been playing Interlude again!

Right.

Maybe I can catch an earlier flight.

Please do.

Interlude II. The long-awaited sequel to the first adult computer game in history is finally here. It's provocative and playful! Outrageous and romantic! It has all the excitement of the original Interlude, plus significant new features.

The computerized interview, which is taken by one or both players, has been greatly expanded. It probes your innermost desires to discern your mood of the moment, your secret longings, your special fantasies, and then suggests for your pleasure one of its more than 160 Interludes. You can ask the computer for an Interlude for now, or one for later. Special options give each player added control over surprises and special erotica hidden in the Interludes.

The original Interlude took the computer world by storm six years ago, creating a media sensation:

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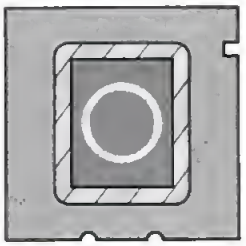
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CIRCLE 125 ON READER SERVICE CARD

■ EDITED BY GUS VENDITTO



PC ADVISOR

The PC Advisor helps readers choose the hardware and software products that are best suited to meet their specific needs.

UPDATING AN OKIDATA

What is an Okidata Plug 'n Play? Will it turn my Okidata 82A into a graphics printer? If so, do any of the mail-order discount houses sell them?

Brooks R. Rimes
Grand Island, New York

The Plug 'n Play is an upgrade kit based on a ROM chip that will let your 82A print the high-order ASCII characters and make it compatible with IBM printers, in case your software is not equipped with Okidata drivers; it's also available for the Okidata 83A. It won't give you the ability to draw freehand-style graphics, with circles and other irregular shapes, but it will bring within your reach the foreign-language characters and various rectangles and Greek letters found on the ASCII table above 127. It costs $55 from Okidata (Mt. Laurel, N.J.; (800) 654-3282; in N.J., (609) 235-2600; part no. 70000801). It's not a very popular item, so most mail-order houses don't carry it; some we spoke with have only recently discontinued handling it.

To get all-points-addressable (APA) graphics, you need to install a different upgrade, the Okigraph 1, which, alas, cannot coexist with the Plug 'n Play. As far as we can determine, the Okigraph 1 is available only from Okidata or authorized dealers (part no. 57514905; $55).

To get both capabilities, you'll have to shop for a new printer. Our special issue on printers (PC Magazine, *Volume 4 Number 19) is a good place to start.*

Or you could try faking the ASCII graphics characters by running the "print swap" program we ran in the Programming column in that same issue: PRSWAP. It uses substitutions and combinations of standard text characters to fabricate the high-order ASCII characters. This program, in combination with the OkiGraph 1 upgrade, will turn your aging printer into a very flexible peripheral.

TRACKING TOUR GROUPS

I'm a travel agent and I need to maintain schedules for six different types of bicycle tours. What I most need is a system that will give me daily updates of the chores that need to be done that day. I've looked at spreadsheets and project managers, but none of them is right for one reason or another. Can you recommend something?

Robert Carpenter
Teaneck, New Jersey

Sounds like a good relational database is what you need to keep your tours on schedule. A spreadsheet does not have the powerful organizational features you need, and a project manager doesn't have the flexibility to have several overlapping schedules.

Any database with the ability to do global date updates should easily fill the bill. It should also give you the bonus of better tracking of your clients. Ashton-Tate's dBASE *could do the job with power to spare, but it's a difficult program to master. For your needs,* PowerBase *(PowerBase Systems, Birmingham, Mich.; (313) 540-0900; $349),* DataEase *(Software Solutions, Trumbull, Conn.; (203) 374-8000; $600), or* Paradox *(Ansa Software, Belmont, Calif.; (800) 547-3000; $695) should have the right combination of power and ease of use. One caveat:* Paradox *requires 512K bytes of RAM.*

MORE MAPS

*Jerry Levy has a rather dramatic sense of timing. Soon after he asked for—and we recommended—software that can produce maps to illustrate regional sales breakdowns (*PC Magazine, *Volume 5 Number 7), several more products were introduced:*

- MapMaster *(Decision Resources, Westport, Conn.; (203) 222-1974; $395), which was reviewed in PC News (Volume 5 Number 9), can import data from spreadsheet .DIF files.*
- RandMap *(Rand McNally; Chicago, Ill.; (800) 332-RAND; $995 or $795 if payment accompanies order) is an update to* StatMap *and has the distinct advantage of being able to import* dBASE *data as well as .DIF files.*
- *And* Diagraph *(Computer Support Corp., Carrollton, Tex.; (214) 661-8960; $395), a full-scale presentation graphics package, has added a $99 U.S. Atlas module to its current set of libraries. It works only with* Diagraph *files and its storehouse of several thousand images.*

ASK THE ADVISOR

Send your questions about hardware and software choices you are facing to PC Advisor, *PC Magazine,* One Park Avenue, New York, NY 10016. Or write via MCI Mail to G. Venditto.



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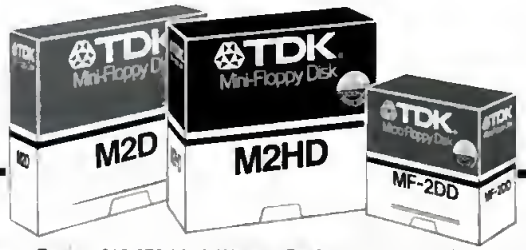
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To find and fix, Brief has text search abilities rivaling "grep", with wildcards for matching, indifference to intervening characters, acceptance of character ranges, even multiple choice of patterns and their replacements.

If you use Lattice, C86™, or Wizard, and have 320k, you can compile your C program without ever leaving Brief. It finds the lines with errors, and marches you through the text for repairs.

Parts of Brief were written with its own Lisp-like macro language which has structure, 32-character variable names, conditional execution, loops, and you can actually read it! Nothing like the hieroglyphs we've seen elsewhere. Bulletin board and public domain disks with macros. Disk of contest-winning macros comes free with your purchase! "Simply the best text editor you can buy", Dvorak *Infoworld* (Needs 192k.)

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MULTI-HALO *Multi-Board Graphics Library*

The premier graphics library that got the ball rolling for PC-based graphics and has grown so omnipotent that it supports over 25 graphics boards — including IBM's EGA and Nr. 9 Revolution's hi-res series — and has a multitude of mouse and printer drivers. All that in each box. Separate C versions for Lattice, M'soft, Aztec, C186. What does Multi-Halo do? Just about anything. A full "paint" was written using it. Wonderful value for single license. Costly royalties though for redistribution. Specify: S0315 & Language. List: $250. We: $199.

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All functions are in separate modules, only those used are linked. Only buffers holding on-screen or temporarily obscured windows occupy RAM, others released dynamically. TopView™ compatible. Best overall rating and fastest display in Bill Hunt's 7/85 *Tech Journal* review of five windowing products.

Windows for Data comprises all of Windows for C but takes in data through the windows as well. At the high level a single function lets you specify prompt string, field length, data type, screen location, picture, target variable, then sets lesser functions scurrying to get and process a user's input — any of which functions are available directly. There are utilities to get system date and time, mess with strings, create your own field masks.

Field options can require entry, prevent entry, permit insert or overtype, beeping on invalid or overflow keystrokes, and attachment of field-specific help messages and functions you want called to display messages or validate entries. And you decide which keys will clear a field, jump to the next or prior, quit, etc. Options diverse enough that a set of "fields" can be made to behave like a Lotus™ menu.

Many compilers. Free demo.

Specify Compiler	List	PC Brand
T0100 Windows for C	$195	$169
T0150 Windows for Data	$295	$259

C-TREE *B-Tree File Manager, Source Code, No Royalties!*

C-tree™ has been around since 1979. (It became Digital Research's Access Manager™.) That means seasoned, sturdy code which hasn't cracked under the weight of prolonged and widespread use. C-tree comes in C source code, revealing all you've ever wanted to know about how b-trees are written. Provided you bind it into your binary application, you can redistribute C-tree without royalties.

C-tree's design splits nodes to allow any number of users to access an index file simultaneously even when updates are in progress. So multi-user configurations and adaptation to networks are possible. You must write record-locking routines, as they are compiler and operating system dependent, but shows how.

Thanks to source code which does not deviate from the K&R standard, C-tree can travel. Tests in many environments prove that C-tree gives your application a ticket to anywhere.

C-tree permits any number of keys for a data file, supports duplicate keys, variable record length files, multiple key indexes in a single file, etc., etc. — it's a comprehensive product with everything you'd expect. Intelligently designed, too. Both high level ISAM routines which minimize coding by handling all details of an activity, as well as decomposed step-by-step functions you can access directly. Either way C-tree maintains optimal index structures which will find the record you seek amongst a million ten-byte keys in no more than five disk seeks.

Ask for:	List	PC Brand
F0660	$395	$329

dBC *Lattice Library Maintains dBASE Compatible Files With the Power and Speed of C*

dBC™ links C to dBASE. It creates and maintains files and their indexes which exactly replicate dBASE file design. So dBASE can read and update them. And the reverse. dBC can use any files created by dBASE. Now C and dBASE can operate on the same data bases interchangeably.

That opens up the widespread culture of dBASE installations to exploitation by C programmers. You can tap that market, avoid the resident dBASE language, and gain all the advantages of C with this single product.

dBC's functions parallel all dBASE's file handling commands, many decomposed to give closer control. The manual discusses each backed by demo source files on disk.

Use dBC for custom work for clients, or on its own. It's a complete ISAM file manager for C whether or not dBASE will be used in tandem, supports all four memory models, and can have sixteen index and data files open. Big discount to buyers of both dBASE II and III versions. Specify Lattice, Microsoft 3.x, or DeSmet Versions:

	List	PC Brand
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LCIII With Source	$500	$390

C-WORTHY LIBRARY *Fits Out Applications with Shipshape Interface* — PIPE THIS ONE ABOARD!

Many libraries launch flotillas of functions for small crafting — re-working of strings, positioning the cursor, etc. C-Worthy, by contrast, is a formidable battle wagon for major C engagements.

The C-Worthy Library™ wraps an entire user interface around your application. Its full power can be summoned by only a few high level calls. Sound exaggerated? A single function call can set up a complete text editor in a screen window.

- High level calls pop menus and scrollable choice lists to the screen, restoring the background when dismissed, and branching to the chosen activity in your application. A full function set handles doubly-linked lists defined by C structures.
- Windowing facilities open portholes of up to screen size for viewing virtual screens larger than the physical screen.
- Full context-sensitive help screen management takes over this chore. Keyboard entry routines look for the help key on their own and interrupt with pageable text windows explaining what to do next.
- Full error message interface sends error codes and the functions which return them to C-Worthy which counsels user, you get to remove all that error-checking clutter from your core program.

Your application is nested in these powerful emissaries to the outside world. C-Worthy's imaginative architecture then makes heavy use of C's pointers to functions to find its way into your application to act upon the user's request.

Separate utilities maintain help and error message text and lists in files. This text segregation means applications can readily translate into foreign languages without reprogramming — doubly so because C-Worthy display routines automatically resize for text length.

Where the high level interface does not suit you, the low level routines are available as decomposed functions. All machine dependency such as key mapping is housed in interchangeable overlays loaded alongside the application at run-time. C-Worthy applications can thus run on a mix of PC and MS-DOS machines without recompilation.

C-Worthy hands you a consistent and intuitive interface and a revolutionary design approach. Novell found it "played a key role and accelerated development" in making its NetWare™ utilities easier for users. "You owe it to yourselves to take a look." Binary Lattice. Others coming. Ingenious demo: call for it.

Ask for:	List	PC Brand
T0500	$295	$269
T0550 Novell Network	$495	$449

CURSES *Unix Style Screen Management*

Curses from Lattice™ manages the screen of the PC like Unix™ curses. Library of 84 functions and macros parallels Unix with matching parameter lists. So your Unix program will feel at home when you move it to the PC, and programs created on the PC will be Unix compatible. Keeps any number of screen images in memory, full or partial size. Supports color, all four memory models. Vast function set to get characters, wrap lines, scroll, blank lines, highlight, etc. Carefully follows Unix curses terminal orientation by re-painting physical screen only on your refresh command.

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TODAY's TOP QUALITY AIDS TO PROGRAMMING PRODUCTIVITY

PRE-C
Thorough "Lint"-like Analysis Now on the PC

Unix users have always had "lint" to thoroughly clean programs before they disappear into a compiler.

Pre-C™ looms larger than "lint." It finds problems your compiler won't. Problems that a debugger will have trouble figuring out. Even problems which will cause trouble with other compilers.

Pre-C finds all the syntactical tripwires that will blow out a compiler and much subtler problems: code which will never be accessed, casts with suspect conversions, variables declared as external but never used, functions never called, machine-dependent expressions which inhibit portability, obsolete usage.

But the big service of "lint" is thus. Compilers work with one module at a time. They know nothing of other modules which only meet up at link time. Pre-C looks at *all segments of your program at once* and reports to you any inconsistencies of inter-module references like conflicting data type declarations, parameter lists in calls which disagree with the functions themselves in number or data type.

Pre-C uses the Unix System III compiler standard to guarantee maximum portability anywhere in the C world. Plentiful command line options relax such rigor during early coding when work is incomplete.

Use purchased binary libraries? Profile them for Pre-C and it will thereafter insure that function calls from any C program are letter perfect. A miracle worker in speeding large system development. Needs 128k minimum, 192k recommended.

Ask for	List	PC Brand
P0590	$395	$295

DAN BRICKLIN'S DEMO PROGRAM
Slide Show Your Latest Greatest Idea

INDISPENSABLE!

When the inventor of the electronic spreadsheet called with a new program, we sat straight up in our chair. VisiCalc™ was for businessmen, but Dan's latest is for us programmers.

Ever had trouble putting a program idea into words? Programs are screens! Words don't work. The answer? Show your program as a procession of screens.

Dan's new program makes it easy. It creates slide shows that imitate a program's screens and sequential activity. Create a screen — a snapshot of your planned product as it runs. Anything goes: words, borders, box rules, inverse and underlining of monochrome, foreground and background color on the CGA and EGA. Press a key and make a copy of this "slide", change it a little, by a single character perhaps, to show the next instant of run-time, then copy the slide forward again. Create a whole slide show of your program in action. It will seem like the program itself is running.

Each screen is in 80x25 character mode, not bit-mapped graphics. All 250 characters and attributes are available from scrollable lists which pop to the screen. All commands are layered in Lotus-style pop-up menus, with frequent choices mapped to the function keys as well.

Screen areas can be blocked for cut and paste or filled with color or characters, even made to blink. Slides of oft-appearing segments can be made for overlaying on other slides, and any slide may have several overlays assigned to it. Slides can be shuffled, deleted . . . many quick tools to save time, disk space.

Slides can proceed at time intervals or in response to keystrokes, and depending on a user's response, you can tell the program to branch anywhere in the slide sequence to create innumerable paths through your show.

Don't make your ideas struggle through coding to get to the screen. Dan's Demo is invaluable to prototype the program you are about to write, to position all the labels, choose the color decor, smooth out the keystroke interface *before* it gets etched in code. Or load the "capture" utility above the operating system, snapshot the screens of any running program, and load an instant slide show into Dan's program. Makes tutorials a snap.

Dan's Demo has blossomed throughout Lotus™, we hear. "Lotus [was] my major test site", says Bricklin.

Each purchase entitles you to redistribute fifty copies of the slide projector program along with your show. Plain manual, no binder, to keep the price low because Dan thinks everyone should have one (he's right!). You'll wish he had Demo then and left VisiCalc for now. (Needs 256k)

Ask for	List	PC Brand
N0100	$75	$69

BASTOC
Translates BASIC Programs Into C

OPTIMIZES!

For a trifling price, BASTOC™ will move truckloads of BASIC code over to C. It is a translator which takes in Microsoft Extended or CBASIC and emits pure Kernighan & Ritchie C for the Lattice compiler. It will optionally convert your program into a single monolithic C function or will decompose it into separate functions, one for each GOSUB label.

Version 2.0 adds optimization, with dramatic reductions in execution time. It converts to C integers those numeric variables it finds in BASIC programs which really do not need floating point. It eliminates unreachable code. Where BASIC uses full assignment statements to increment and decrement counter, BASTOC converts to C's compact form, nested in other statements. Strings are dynamically allocated in the target program, ridding your application of BASIC's catatonic halts for garbage collection.

BASTOC will try to create structure of even the most convoluted BASIC code, and writes any indigestible statement into the C output as a comment accompanied by an explanation of the problem. Also, you can optionally tell BASTOC to insert BASIC source lines into the C target as comments, a dandy way to learn the differences between the languages.

Specify	List	PC Brand
S0375 & Which BASIC	$495	$399

PANEL
Feature-Laden Screen Design Tool

The newest version of this premier programming tool lets you layer your screen designs with up to ten overlapping images, making it easy to background a screen with pop-up lists, help boxes, and alternate sets of input fields.

Writing your own screenware is a good way to blow completion dates and profits. Panel™ works with you interactively to set up foolproof screen displays and data entry forms rapidly. It tests your form to prove that it (and test data) behave correctly, then converts the finished work into C source code for incorporation into your application. Compile with Lattice or Microsoft.

Wonderfully diverse attributes may be selected for any field — size, data type, color, of course, but also conversion of input to upper case, clearance of existing data when new entry is started, masks for standard formats (eg, dates, phone numbers); a choice of styles for numeric fields; phrases which fill in when their first letter is typed; multiple-choice lists from which to choose a field fill-in by cursoring a highlighted bar. Fields may be multi-lined (eg, name and address as one field) and scrolled if larger than the screen space allotted them.

Panel builds in a user interface for keystroke movement within and between fields, and supplies extensive validation routines for checking user field entries — in source code, so you can tack on your own unique variants. Screen designs may be dynamically loaded from file, or compiled into a program, and version 6 has optimized code to quicken display speed.

The whole package is wrapped in a monitor and keyboard customization package to tailor your application for other equipment. Panel. A superior productivity tool now bigger than ever.

Ask for	List	PC Brand
S0400	$295	$229

BTRIEVE
Queen-B File Manager Abdicates Royalties

VERSION 4.0!

This queen of b-tree file managers was unapproachable to programmers for whom royalties would ruin profit margins.

So it's quite a ukase indeed that one need no longer pay a tithe to incorporate Btrieve™ in applications.

Now there is version 4.0, which hugely speeds DOS interaction, especially for large files with multiple keys. It also adds support for variable length records of virtually any length. Other new features: a read after write option to verify accuracy, useful in gritty environments like manufacturing floors; file password to deny unauthorized access or read only; and data encryption to assure network privacy.

Btrieve's foundation is a balanced-tree indexing scheme, conceded to be the fastest search technique devised (it will find any key in a million-plus item index in four or less accesses). Btrieve takes complete charge of all file creation, indexing, reading, writing, insertion, deletion, space recapture, and forward and backward searching based on full or partial keys. It builds commands right into the language you use in the form of functions you call to tell Btrieve what to do.

Btrieve has mainframe specifications! A single file may have up to 24 indexes. Segments of keys may be indexed. Each index can independently accept or block duplicate keys. Fixed record lengths can be up to 4090 characters, variable length records 64k, indexes 255 characters, files up to 4 billion bytes. It can even extend a file across two drives—even two hard disks!

Interfaces to C, Pascal, BASIC, and COBOL with single purchase, sample programs in all four languages.

The network version works with any network that supports the MS-DOS 3.1 file sharing function.

Code	Version	List Price	PC Brand
S0650		$245	$199
S0652	Network	$595	$529

PLINK86 & PLUS
Dynamic Cache Overlays Maximize Memory Use

Plink86,™ long the overlord of overlay linkers, now has a Plus version. As a linker Plink can be used with any compiled language which delivers Microsoft/Intel format object files. It yields automatic symbol tables and more memory maps than DOS LINK, but its overlay power has won its reputation as a miracle worker. Plink86 shoe-horns large programs into small memory by binding into your compiled program an overlay manager which knows how to swap modules of large linked programs between disk and shared memory space. Plink86's straightforward overlay description language allows you to describe your overlay hierarchy in a structure permitting up to 4,095 overlays stacked 32 deep.

So if your program needs large chunks of memory, you no longer forego sales to folks who have less. But if you've assumed 128k, and they have 640k, Plink86-Plus™ knows to use extra memory as cache for overlays — at full speed compared to disk swapping. It also can automatically restore a displaced overlay to which a subsequently called overlay must return, and assign library modules to either a program's root segment or overlay areas.

Plink, the programmer's choice even when CP/M™ was the poobah of

Code	Product	List Price	PC Brand
S0500	Plink86	$395	$289
S0499	Plink86 Plus	$495	$359

GREENLEAF LIBRARIES
FUNCTIONS

New 3.0 has 225 functions in *both C and assembler source* as well as library format. We have versions for Lattice, Microsoft, C86, Mark Wms. New emphasis on tighter functional groupings to minimize excess baggage of functions loaded whether used or not. Manual's 250 pages now help select functions, as do demos and bulletin board. 32 DOS extensions: file and directory manipulation for 2.0 and f.1. 23 Screen Functions: Select mode, page, monochrome or color, palette, cursor shape, positioning; clearing and scrolling; pixel get and put; read light pen. 60 String Functions. Manipulation of strings, including center and justify, efficient list operations which add, delete, and sort pointers to strings for top speed. 50 Graphic & Printing Functions. Primitives to access all graphics, typeface, formatting, and forms control. Plus keyboard status and function key assignment, time and date algorithms, read registers, memory size, peek and poke.

Ask for	List	PC Brand
S0770	$185	$139

COMMUNICATIONS

Want your application to communicate with other users or remote date bases? Now you can build asynchronous communications right into your C programs! Over 60 functions and demo programs *in both C and assembler source* code set up an interrupt driven scheme with separate transmit and receive ring buffers (characters are simultaneously loaded at one end and transmitted from the other, or vice versa) for an arbitrary number of ports. Interrupt control means you can download a record, then halt the incoming stream to file it, display it, let the user tamper with it, send it back up line. It all happens within the context of your program. Goodbye separate communications software.

The Greenleaf Comm Library supports ASCII or binary, any parity, any word length, 8250 UARTs, all four Lattice C memory models, Hayes 300,1200,1200B and other modems.

Its 80-page manual has examples of each function and guides you through asynchronous communications.

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RUN/C PROFESSIONAL VERSION

Interpreter Now Accesses Binary Libraries

RUN/C was an innovetor for converting inaccessible compiled C to an interpreted language as easy to grab hold of as BASIC. Great for learning, but a problem remained for pros An interpreter expects nothing but source code, and that put the vast resource of professional binary libraries off limits

No longer RUN/C Professional™ has the tools dynamically to load and unload multiple binary function libraries while in its interpreter Your code can now reach for functions in the commercial C libraries like C-Food Smorgasbord™. opposite— potentially eny library compiled with Lattice's large model How? The manual shows how to develop the interface to a library, using the Lattice compiler (a must!) How about your own archive of functions? No reason why not.

The RUN/C Interpreter

The interpreting engine lies at the heart of both the improved original RUN/C and the new Professional version Its creetors hed the inspiration to make once formidable C behave on screen much like PC BASIC with a full-screen editor like WordStar® Just create a program and RUN it If it stumbles, LIST it, EDIT it, add lines, delete lines, RUN it again, fix it again Use familiar commands like LOAD, MERGE, SAVE, FILES, even TRON and TRACE, and a free profiler

RUN/C is ideal for rapid program development Put up code at high speed, tinker and re-arrange, try out things devil-may-care, and let RUN/C find your typos and maleprops

RUN/C has a treasury of functions built into the interpreter — over 100 paralleling the most used functions found in standard compiler libraries So when and if the time comes to compile, your source code will find counterparts

There are lots more feetures — system interrupts, a shell command to invoke any operating system command without leeving RUN/C, even the ability to load a preferred editor in parallel and switch back and forth.

RUN/C Standard Version

Straight RUN/C has all above but the Loadable Libraries™ docking module It utilizes source code only, whether creeted by its own editor, or from any ASCII file, such as programs you've already written, or commercial libraries which supply source code.

It makes a splendid teacher The manual has not just instructions how to use RUN/C, but its 500-plus pages provide a thorough-going demonstretion of the C language itself Every feature, of C or RUN/C, is accorded its own micro-chapter Over 100 of these chapters are devoted to RUN/C's built-in functions, and every one lists a sample program showing how it is used The programs are also on the disks So as you reed them in the manual, you can run them on the screen (Needs 180k-256k recommended)

RUN/C Professional

RUN/C Pro has every feature of RUN/C regular plus the binary library link-up and an extra level of debugging aids They are ingeniously installed behind a built-in function, so you can call for debugging conditionally The called function paints a menu of debugging tools to choose from, including immediate mode to display variables, single-step tracing, end changing of variables

RUN/C Professional can tackle projects of any size Use it as a creative front end to feed a continuous stream of source code into compiled modules Only the source work in progress is still interpreted, the finished modules will whiz by at object speeds It will change how you work. (320k minimum and 512k recommended to fit libraries)

RUN/C quite a run for your money

Ask for		List Price	PC Brand
S0910	RUN/C Classic	$120	$109
S0950	RUN/C Pro	$250	$185

LATTICE C VERSION 3.0

Major Upgrades to the Best Selling C Compiler

Lattice has labored and come forth with the long-awaited Version 3 0 of its top-rated compiler A long list of enhancements, adoption of the ANSI draft standard, documentation rivaled by few, and add-on libraries matched by none in sheer quantity restore Lattice C™ to its leadership role as the C compiler to beat

Lattice now embraces key UNIX™ enhancements which have entered the language since Kernighan & Ritchie: void functions returning no value, enumerated data types to assign stepped values to variables, the ability to pass data between structures by assignment statements. And 3.0 adopts checking of external function arguments by data type as proposed by ANSI to kill bug swarms when modules join up at link time.

The greatly expanded libranes, now comprising 325 functions(!), enable the file sharing and record locking provisions of DOS 3 1, provide a full complement of transceodeotals, and a host of utilities to mimic the UNIX and XENIX™ environments

Lattice now delivers smaller EXE files, curing one past complaint, boasts very fast link times and a more efficient aliasing algorithm,

The compiler now defaults to the ANSI proposed standard when you need a strict mistress, but command line options tolerate straying New options generate code to use 80186 and 80286 features, and the 8087 is of course sensed and utilized if aboard

Lattice has enjoyed pre-eminence so long that developers have created far more tools to marry into Lattice C than any other compiler Programmers now have an enormous resource of libraries and utilities to use with Lattice to speed their work William Hunt, in his exhaustive analysis of 12 compilers in the 1/86 issue of the *PC Tech Journal* awards Lattice the only "very good" rating for add-on library availability He sums up with this all-around accolade: "a fine product to consider for the production of important applications."

Ask for	List	PC Brand
S0100	$500	$CALL

BETTER BASIC

New Version Compatible with Microsoft BASICs

This hearty implementation provides a real alternative to technical languages like C It melds the most useful features of C, Pascal, and Modula 2 into BASIC, while retaining the familiarity of a language already known to millions And now Version 2 0 is 100% compatible with Microsoft's GW™ BASIC and IBM BASICA including graphics, sound, and assembly language calls. Just load old programs and run Save and they are converted to BetterBASIC

It's big BetterBASIC's hugely expanded features require 192k, your programs can go all the way to the PC's full 640k It's comfy Behaves like Microsoft BASIC at the interactive level, with a full-screen editor, direct statement execution, and always poised to RUN It's fast BB is an incremental compiler—unlike with interpreters each statement is checked and compiled just once The Sieve benchmark runs *six times faster* than with Microsoft

BetterBASIC® has C-like structures for reference to entire records so say goodbye to FIELD, MKI$, CVD, LSET, etc It has "procedures" summoned by name unlike GOSUBs Lots more features built-in linker for compiled modules, trace, debugging breakpoints, cross-reference command, 32k strings, DOS and BIOS calls and interrupts, recursion

Ask for		List Price	PC Brand
S1200	BetterBASIC	$195	$169
S1201	Run-time Module	$250	$239
S1202	8087 Interface	$ 99	$ 89
S1205	Btrieve Interface	$ 99	$ 89

The GSS GRAPHICS SYSTEM

Leave the Driving to GSS

ANSI CGI STANDARD!

GSS™ has reconfigured two components of its comprehensive graphics tools to conform with the more advanced ANSI Computer Graphics Interface (CGI) standard

At the heart of the system is now the Development Toolkit which contains all language interfaces and device drivers for keyboards, mice, joysticks, tablets, printers, plotters, cameras, and more Drivers now house all management of vector graphics (plotters) and bitmaps used by raster input devices (scanners) to insulate completely the application program from concern for device idiosyncracy No one else has implemented CGI that way It means programming remains generic, just switch drivers and the same program will drive e different device, including intelligent controllers which do not want micro instructions

GSS Kernel™ conforms to level 2b of ANSI's Graphical Kernel System (GKS) and contains all its needed drivers and language bindings Kernel has macro level tools to draw and color an object, store the sequential instructions, and recreate the object on its own, as well as segment it, transform it, etc , all the while returning data on attribute settings, system and device status So powerful, a single command may represent several score lower level statements

Plotting has the equivalent GKS tools for graph and chart generation and their captioning: hand it apples and oranges, say "pie", and it bakes the numbers into a digestible display for screen or plotters

Kernel and Plotting have tools to convert images they create to ANSI Computer Graphics Metafiles (CGMs), a tokenized standard for storing every form of graphic image as data The Metafile Interpreter reads the contents of a CGM and interprets it with full CGI capability for re-creation on various devices, and you can cut and paste before display

Quality software? IBM thinks so They sell the GSS series under their own label

Unit royalties and annual fees have been instituted for redistribution Call for schedule Needs 256k

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GS010	CGI Dvlpmt Toolkit	$395	$339
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GS040	Metafile Interpreter	$250	$209

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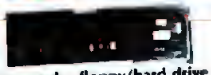
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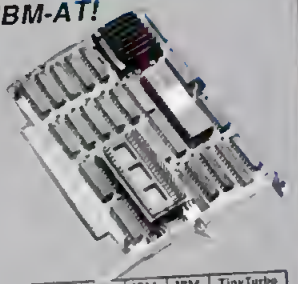
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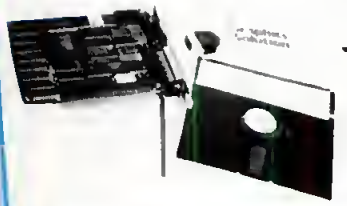
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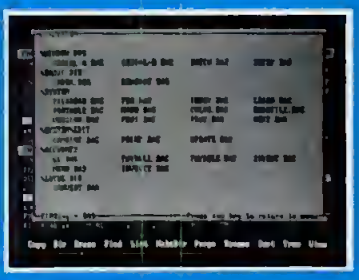
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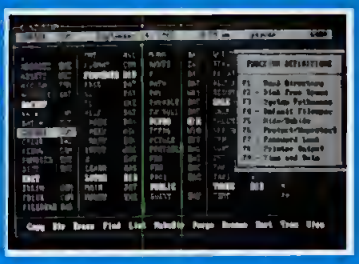
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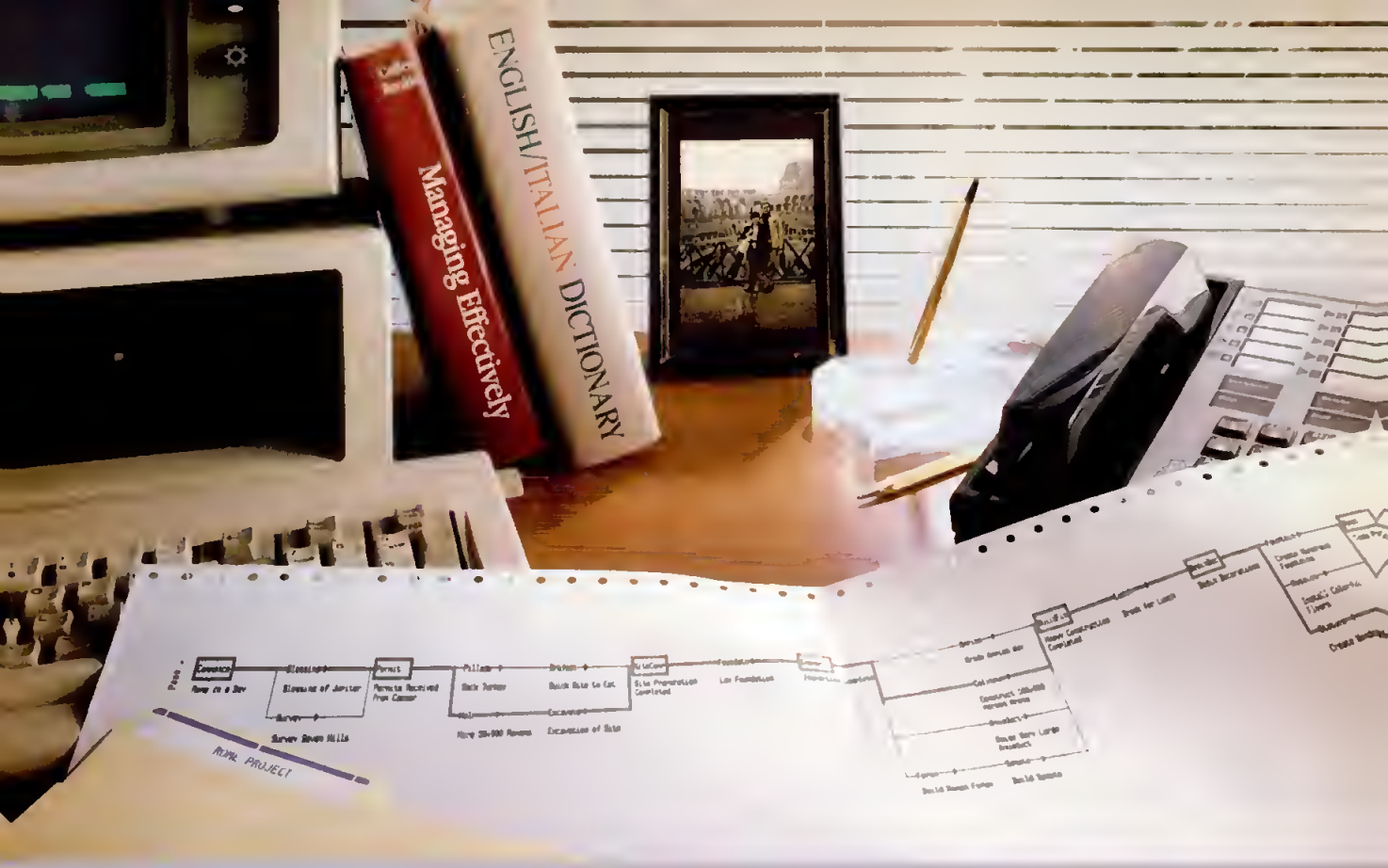
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Works inside another program	Yes	Yes	No	No	No	No
Display Directory	Yes	Yes	Yes	Yes	Yes	Yes
Sort Directory	Yes	No	Yes	Yes	Yes	Yes
Find any file on hard disk	Yes	No	No	Yes	No	No
Copy erase or rename file	Yes	No	Yes	Yes	Yes	Yes
Selective file erase command	Yes	No	No	Yes	No	No
Batch file copy or erase	Yes	No	No	Yes	No	Yes
Change file attributes	Yes	No	Yes	Yes	Yes	Yes
Change default subdirectory	Yes	No	Yes	Yes	Yes	No
Create new subdirectories	Yes	No	No	Yes	Yes	No
Display Visual TREE	Yes	No	Yes	Yes	Yes	Yes
Check free space on drive	Yes	No	Yes	Yes	Yes	Yes
Display file in ASCII format	Yes	No	No	Yes	No	Yes
Display file in HEX format	Yes	No	Yes	No	No	No
Check or set time and date	Yes	No	No	No	No	No
Send printer control codes	Yes	No	No	No	No	No
Select default printer	Yes	No	No	No	No	No
Password lock computer	Yes	No	Yes	No	No	No
Screen timeout feature	Yes	No	Yes	No	No	No
Windows						
Utility protected	No $49.95	No $84.95	No $95	No $49.95	Yes $49.95	No $99.95

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CIRCLE 299 ON READER SERVICE CARD

PC MAGAZINE NEWS

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Developers Chart Course For PC's Graphics Power

PC ANALYSIS

Does the recent bonanza of graphics hardware and software illustrate the market potential? Or is it art for art's sake?



BY CHARLES BERMANT

For years, PC users were willing to crank out a thousand words instead of using a single picture—or chart or graph. With all the new graphics hardware and software that's recently come to market, that may change.

New software ranges from a $97 memory-resident chart utility to a $750 version of a powerful mainframe system. Hardware's maturation has been fueled by more-sophisticated printers, plotters, mice, light pens, and digitizing graphics scanners.

Hercules, creator of the current monochrome graphics standard, will release three new products this year. Paradise Systems has designed a single chip that emulates IBM's EGA, CGA, and monochrome standards, Hercules and Paradise monochrome graphics, and Plantronics color graphics.

Looking beyond the current EGA standard of 640 by 350 and 16 colors, Intel and Texas Instruments are readying their 82786 and 340-10 applications chips, which could supply more graphics power for personal computers in 1987.

GSS Pushes DGIS

Leading the way is GSS in Portland, Ore., which is pushing the DGIS graphics interface, meant to save graphics from the confusion present in many other categories (see PC

(continued on next page)

AST SixPakPremium Holds Up to 2 Mbytes on Board

PC FIRST LOOK

BY GLENN HART

AST invented the multifunction board, which lets you add memory, input/output ports, and other functions while saving precious slots. Its SixPakPlus board has been the all-time best-selling example, with up to 384K RAM, one serial port, a battery-backed clock/calendar chip, and an optional parallel port.

AST's new SixPakPremium puts 512K bytes to 2 megabytes on its full-length circuit board and adds support for both the Lotus/Intel/Microsoft expanded memory specification (EMS) and AST's EEMS superset version (enhanced EMS), which lets you add memory above the nominal 640K limit imposed by DOS.

The board includes a clock/calendar, a serial port, and a parallel port standard; a second serial port and/or a game port for one or two IBM-type joysticks can be added as well.



The SixPakPremium expands the memory of PCs and XTs far beyond the 384K-byte limit of the SixPakPlus.

The SixPakPremium card it-

(continued on next page)

Illustration: Warren Gebert; Photograph: Thom O'Connor

Graphics Power

(continued from preceding page)

Update, page 54). Says GSS director of communications Dan Fineberg: "PCs are now powerful enough to handle the memory and performance requirements of a graphics package, and output devices are more sophisticated. And new graphics chips are allowing speed and performance to be increased five- to tenfold."

Speed, in fact, is the critical factor. Users accustomed to seeing their ATs whiz through spreadsheets are troubled to see graphics images take a minute to unfold on-screen.

1-2-3 Needs Help

Lotus's *1-2-3* unwittingly fuels the demand for better graphics because that is the one area where it falls short.

"There are limitations of *1-2-3* in graphics arenas," says Dataquest vice president of graphics industry services Lewis Brentano, adding, "It's hard to use and not very flexible." Echoes Yankee Group industry analyst Michael Goulde: "The graphics output of *1-2-3* is not publishable or usable in a presentation."

It is with its Lotus interface that Software Publishing's new *Harvard Presentation Graphics* ($395) has gained the most resounding praise, quickly transforming complicated spreadsheet data. "Import and export is critical," says Software Publishing product manager Tess Reynolds. "Any successful graphics package will need to have a Lotus interface, along with the ability to export to word processors." Reynolds adds that an infatuation with glitz can be just as ineffective as ignoring graphics entirely.

Laser printers and 24-pin dot matrix printers allow documents to include graphics without cutting and pasting. Datacopy recently introduced an under-$3,000 300-dot-per-inch scanner that can digitize, manipulate, and store images and merge them into text.

The American Programmers Guild Ltd. of Danbury, Conn., markets *Inset*, which takes a "snapshot" of screen graphics and merges it into word processor text; Multimate sells it with its *Advantage* word processor as *GraphLink*.

> "Graphics is the most natural form of communication and understanding. People have always found pictures more eloquent than words."

Who Needs Graphics?

Some analysts greet new graphics packages with guarded enthusiasm. Dataquest's Brentano acknowledges the need for business graphics but not for 100 different programs. And Goulde of the Yankee Group doesn't expect a new software category to emerge. Instead, graphics functionality will become a regular part of all applications packages.

One upstart is Stella Systems of Cupertino, Calif., which released the $195 *Syan* package in April. Stella's parent company has been a major software force since 1981 in Japan.

Stella, which expects to release four different graphics programs this year, is positioning *Syan* as a low-cost alternative to packages like *Microsoft Chart* and *Harvard Presentation Graphics*.

Sean O'Connor, president of Decision Resources in Westport, Conn., says that graphics applications have been a late bloomer in the PC market: "People first started using PCs for what they'd been doing manually—word processing, database analysis, or spreadsheets. They haven't been doing

SixPakPremium

(continued from preceding page)

self can hold up to 1 megabyte of RAM. You can allocate as much of this memory as you wish to round out your PC's normal memory up to the 640K limit and use the rest as expanded memory. An optional plug-in daughterboard called the Premium-Pak can hold up to another megabyte. You can use up to 8 megabytes of RAM in your PC by adding AST's RAMpage expanded memory boards, each of which accommodates up to 2 megabytes.

You use the SixPakPremium's five jumper blocks and two eight-position DIP switches to configure the board for your computer. The board is shipped set up for a common configuration that is likely to be correct for many installations. Setting the board up differently could be a daunting experience if you don't understand interrupts, parity, addressing, RS-232 serial signals, and the like.

The parallel and serial port connectors are on the rear edge of the board. The parallel port uses the normal 25-pin connector, but the serial port terminates in the 9-pin connector first used on the IBM AT. This almost assures that you'll have to buy a 9-pin to 25-pin adapter cable. AST provides mounting plates for the ribbon cables from the optional second serial (also with a 9-pin connector) and game ports; if you add both you'd theoretically need three slots for everything, but AST's $25 Connectall mounting plate eliminates the problem.

Improved RAMdisk

The SixPakPremium is supplied with several utilities that help you use the extra memory in different ways. As with the older AST boards, you can specify up to three RAMdisk emulations of floppy drives (depending on how many real floppy drives you have) that act like normal 360K floppies. A RAM-based print spooler can use as much memory as remains available from either the normal 640K RAM or the extra paged EMS memory. AST's new FASTdisks are RAMdisks without the size restriction; they can be as large as available memory and they fit in *after* the hard disks. Now, for instance, if you have floppy disks A: and B: and hard disk C:, your RAMdisk becomes D:; with AST's older RAMdisk software, the RAMdisk became C: and forced your hard drive to D:.

The final programs, REMM.SYS and REX.SYS, are device drivers added to your CONFIG.SYS file that make the expanded memory available and emulate AT-type extended memory.

Installing all this software, especially with the various memory options, would be complex, but AST includes a terrific installation utility that leads you painlessly through the decisions you must make and modifies your CONFIG.SYS and AUTOEXEC.BAT files automatically. I allocated different patterns of floppy and hard disk RAM emulations and

QuadEMS Supports AST's EEMS Spec

Quadram Corp. of Alpharette, Ga., announced its QuadEMS+ and QuadEMS+ I/O, expanded memory boards that incorporate both the Lotus/Intel/Microsoft expanded memory specification (EMS) as well as AST Research's enhanced EMS (EEMS) superset.

Quadram's Venkat Mohan said Quadram hopes to get a piece of the expanded memory market by offering users a choice.

The QuadEMS+ I/O costs $545 with no memory and includes a clock/calendar, a serial port, and a bidirectional parallel port. The QuadEMS+ is a memory-only board and costs $495 with no memory. Both are expandable to 2 megabytes of memory. The boards were shown at Comdex and shipping should begin this year. ***—Christopher Johnston***

the graphics themselves."

Decision Resnurces is the best-known of several companies that have introduced graphics packages based on maps. Its $395 *MapMaster* program can shade or color maps detailed to the ZIP-code level.

RAM-Resident Graphics

The polarity of PC graphics is illustrated by the presence of both *Graph in the Box*, a $97 memory-resident chart utility from New England Software in Greenwich, Conn. (see "Graph-in-the-Box: Pop Goes the Easel," page 53), and the $750 *ChartBaster/PC*, a mainframe-based system soon available from InterChart Software of Princeton, N.J. *Graph in the Box* captures data nn-screen and turns it into one of 12 graph or chart styles.

"Data in a graph is always generated somewhere else," says New England Software president Alf Peterson. "Graphics has previously been too cumbersome for the normal user."

Peterson admits *Graph in the Box*'s output is not presentation quality. Those who seek a higher level will move ahead—perhaps to something like *ChartBaster/PC*.

ChartBaster/PC is a micro version of the mainframe ISSCO *Tell-a-Graf* package. The PC program uses similar commands and data can be transported between the two environments.

Also for the high end is an upgrade to *Mirage*, the $895 flagship product from Zenographics, which also makes a mainframe version. *Mirage* can output graphics images to film recorders with 2,000- to 4,000-line-per-inch resolution. Zenographics also introduced *Typefaces*, a series of $95 packages that bring typeset-quality text to *Mirage* presentations.

"Graphics is the most natural form of communication and understanding," says GSS's Fineberg. "People have always expressed themselves visually and have found pictures more eloquent than words."

print spoolers with no trouble whatever on my PC, and each worked as claimed. The serial, parallel, and game ports on the SixPakPremium functioned perfectly as well.

Free DESQview Bonus

As if all this weren't enough, AST also bundles a copy of *DESQview* that can access the expanded memory on the SixPakPremium. *DESQview* is an excellent utility that provides windowing, virtual memory to run more programs than will fit in the normal 640K address space, and even concurrency to run multiple programs simultaneously. It works beautifully and is a real plus for SixPakPremium owners.

AST's documentation is detailed and accurate, albeit rather dry and technical. It's a little cavalier about the terms *extended* vs. *expanded* memory—a topic that still confuses many users—but everything you need to know is there.

The SixPakPremium is flexible enough for almost anyone, and offers even more functions than its predecessor, the SixPakPlus, known for its reliability and compatibility. There are many low-cost multifunction cards flooding the market, but as with most things in life you get what you pay for.

PC MAGAZINE FACT FILE

SixPakPremium
AST Research Inc.
2121 Alton Ave.
Irvine, CA 92714
(714) 863-1333
List Price: $595 with 512K RAM; 1 Mbyte, $895; 2 Mbytes, $1,395; second serial port, $50; game port, $50
Requires: DOS 2.0 or later.
In Short: AST switches to 256K-bit RAM chips, puts 512K to 2 megabytes of memory on a version of its best-selling SixPak, and supports expanded memory. Class company, class product.

CIRCLE 446 ON READER SERVICE CARD

Four Makers Show New AT-Compatibles

BY CHRISTOPHER JOHNSTON

Even with IBM cutting prices and raising the performance of its 80286-based PC AT line, competitors believe there's still room for more AT-compatibles. Four were introduced at or just before Comdex by NEC, Panasonic, PC's Limited, and ITT.

After a series of well-executed, high-resolution PCs that weren't IBM-compatible, NEC introduced the Advanced Personal Computer IV (APC IV), an AT-compatible with a 40-megabyte hard disk drive, a 1.2-megabyte floppy drive, eight expansion slots, a 6- or 8-MHz selectable processor, and a keyboard for $5,045. IBM gets $5,295, 4 percent more, for a similar configuration with a 30-megabyte drive. The APC IV is targeted at the CAD/CAM and electronic publishing marketplace. NEC promises a line of peripherals this summer.

Panasonic's 286

Panasonic's Business Partner 286, $2,795, has ten expansion slots, a 1.2-megabyte floppy disk, a 95-key keyboard, 512K bytes of memory, a switchable 6- and 8-MHz clock crystal, and a 230-watt power supply. There is space for two hard disks and a second floppy drive. IBM's comparable AT is $3,995, 26 percent more.

Panasonic is releasing a line of peripherals for its Business Partner series, including three monitors and CGA and EGA boards. Panasonic's national marketing director, Ed Gelb, says more peripherals will be on the way, including an EGA monitor.

Volume shipments of the Business Partner 286 will begin in July.

PC's Limited has unveiled two new, reduced-size AT-compatibles with 10- and 12-MHz speeds.

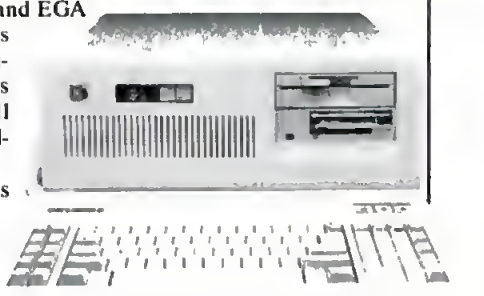
The PC's Limited 286 10 and 286 12 are $2,295 and $2,695, respectively, for a system unit but no hard disks or monitor. Both come with a 1.2-megabyte floppy disk drive, a floppy/hard disk controller unit, a 192-watt power supply, and 1 megabyte of RAM on the motherboard. The unit is no wider than the keyboard, 18¼ by 16½ by 7½ inches.

A 40-megabyte half-height hard disk drive with a 35-millisecond access time is $895 and a 60-megabyte half-height tape backup unit is $795. PC's Limited also released a 13-inch EGA monitor and EGA adapter card for $479 and $269, respectively.

ITT's XTRA XL

ITT Information Systems is targeting its XTRA XL at LAN environment markets, supporting up to 16 users in multiuser mode either as a file server under DOS 3.1 or under Xenix System V.2. The 80286-based AT-compatible system includes 640K bytes of RAM, a 1.2-megabyte floppy drive, an 8-MHz clock crystal, and an 8-MHz 80186-based communications coprocessor.

The XTRA XL comes with a choice of 28-millisecond access hard drives: 40 megabytes, $5,299; and 70 megabytes, $7,299. ITT doesn't see the AT as competition as much as it does workstations like those from Altos Computer Corp.



PC's Limited has released a pair of 10- and 12-MHz AT-compatibles costing $2,295 and $2,695, respectively.

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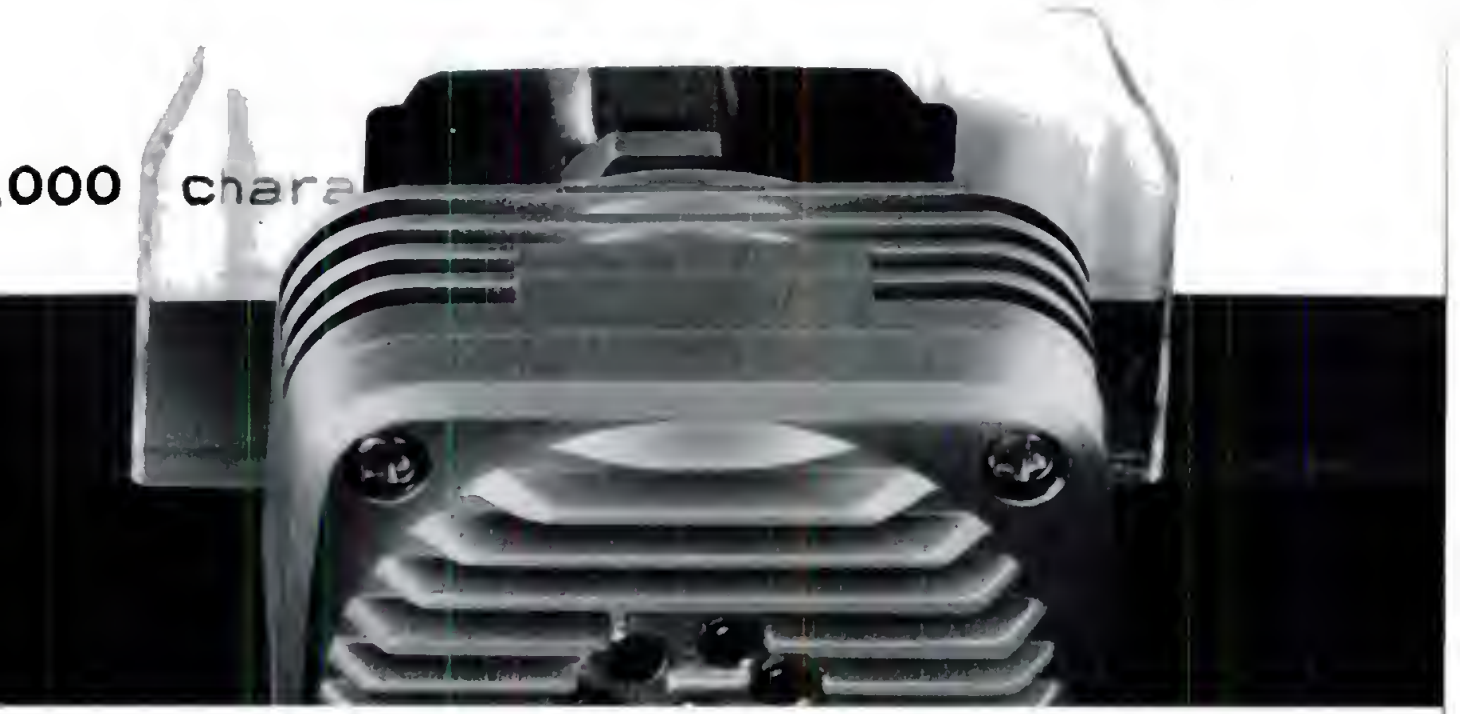


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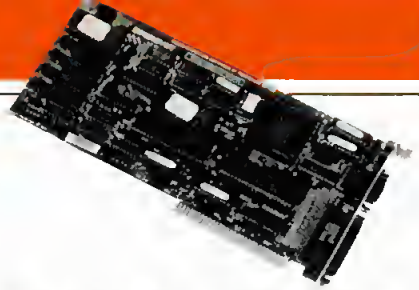
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CIRCLE 229 ON READER SERVICE CARD

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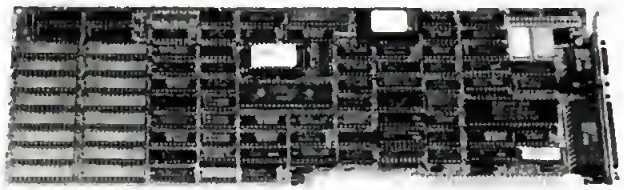


PC FIRST LOOK

BY GLENN HART

Persyst Products, a manufacturer of PC-compatible video adapters and other PC products, recently upgraded two members of its BoB (an acronym for "Best of Both") family of color and monochrome adapter cards, BoB/16 and BoB/MG. Having a reputation for good performance and value in its products, Persyst has targeted the BoB/16 for users interested in high-quality text and CAD applications and offers the BoB/MG as a low-cost, two-in-one video card alternative.

Persyst's new BoB/MG is a video adapter card that provides both standard IBM monochrome and CGA-compatible color output. Similar boards have been available from several manufacturers for some time, but two other video modes set the BoB/MG apart. A gray-scale mode lets you run color programs on a monochrome display with the colors translated into shades of gray, and a 640 by 400 high-resolution two-color mode permits detailed graphics images.



Persyst's $249 BoB/MG (top) is a low-cost video adapter that has gray-scale and two-color high-resolution modes in addition to its monochrome and color output. The $699 BoB/16 offers 16-color graphics output.

Persyst's new BoB/MG is a video adapter card that provides both standard IBM monochrome and CGA-compatible color output.

BoB/16: Color Only

BoB/16 is a video adapter card designed for color-only work, running BoB-compatible color graphics software in 640 by 400 resolution and 16 colors (IBM's EGA card has 640 by 350 resolution and 16 colors). If you have a PC AT, the BoB/16 uses 16-bit access for faster operation.

A comprehensive set of special characters is stored on the board's ROM, and Persyst includes a utility package that lets you design and download your own characters and fonts for both the BoB/16 and Epson FX series printers. In addition, BoB/16 operates at a horizontal frequency of around 24K bytes, and so it must be used with monitors designed for this frequency or monitors that can adjust to the adapter's output, like the excellent NEC MultiSync monitor.

Despite the fine documentation that accompanies the adapters, setting either BoB board to match your hardware configuration can be rather complex, although most users will find the factory configurations acceptable. Small jumpers in several locations are used rather than DIP switches. While there are a lot of jumpers, the flexibility this array provides could be useful in special situations. You can adjust such uncommon variables as the width of color characters, whether the supplied character ROMs or custom ROMs will be used, vertical synchronization, and so on. The parallel port on both boards is unusually flexible. It can provide either standard Centronics or Dataproducts interfaces and be programmed as a bidirectional port for special applications.

Persyst's documentation is unusually complete. Detailed programming instructions are provided if you want to access the boards' registers in your programs. Both boards use a standard 6845 video controller, so that compatibility is likely to be better than with some other controllers. With both boards, Persyst has supplied high-resolution drivers for *1-2-3*, *Symphony*, and *Framework II*, as well as sample graphics primitives written in C.

Manufacturing Error

The BoB/16 reviewed by PC Magazine Labs didn't work as configured from the factory. We discovered a manufacturing error that had the chip that determines whether the BoB/16 uses 8- or 16-bit access installed in the wrong socket. Persyst acknowledges that the error has turned up on some units and the chip installation problem has been corrected. As recommended by the company, moving the chip from the 8- to the blank 16-bit socket solved the difficulty. From there on, the BoB/16 was most impressive. The high-resolution custom text font is crisp and detailed (the character matrix is 8 by 11 dots within a 10 by 16 grid, denser than the text on either IBM monochrome or EGA), compatibility with standard color software was fine, and the high-resolution 16-color drivers worked correctly with several programs, including *1-2-3* and *Symphony*.

PC Magazine Labs' tests of the BoB/MG were uneventful. It worked perfectly as a standard monochrome or color board with various monitors. Color screens filled the display with a mono monitor, not always the case with such boards, and the gray shading provided useful visual differentiation when running color software on a monochrome monitor. The supplied drivers for *1-2-3* worked as promised.

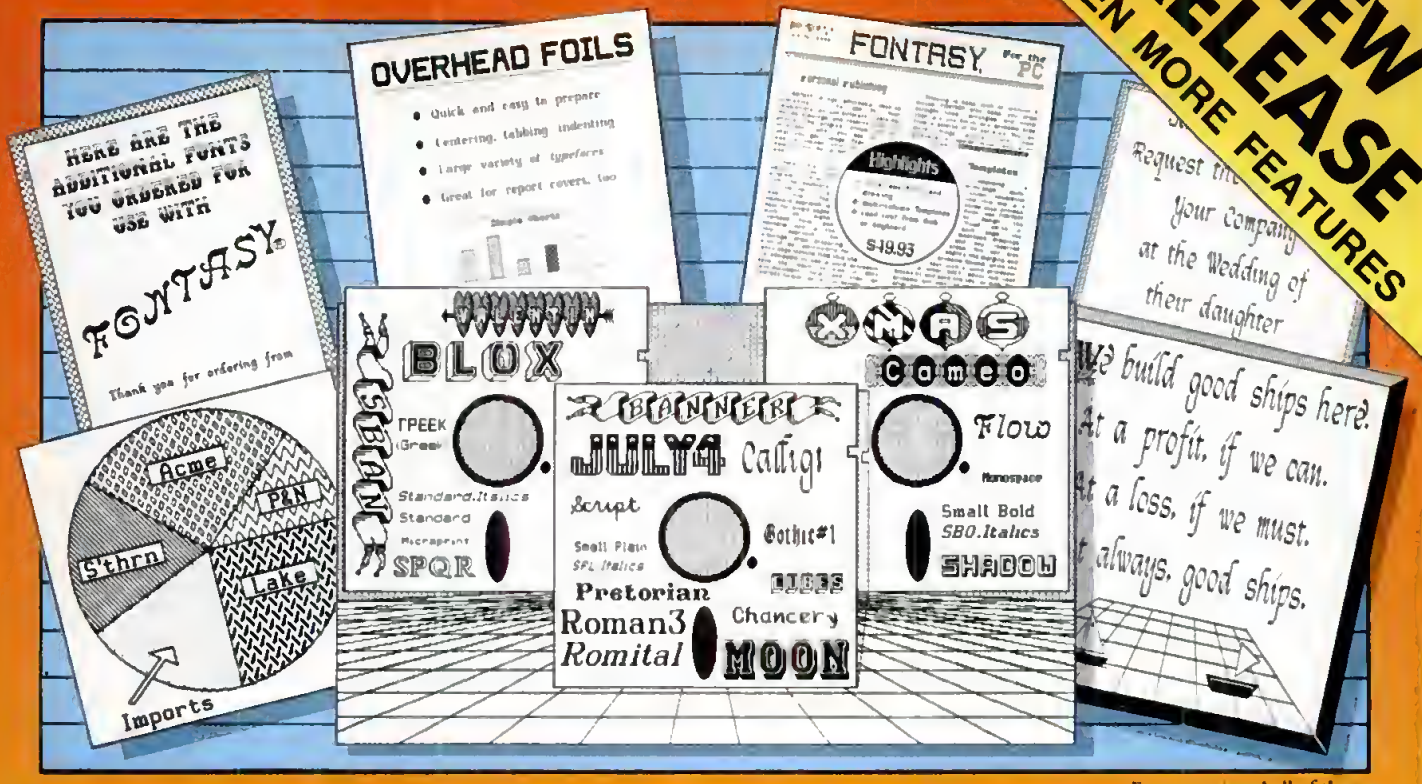
Both BoB/MG and BoB/16 offer flexibility and fine performance. There isn't all that much support for the high-resolution BoB mode, though, and so perhaps the only question is whether either the rapidly emerging EGA color standard or Hercules-compatible monochrome graphics is important to you. Several new video boards offer EGA, CGA, MDA, and Hercules compatibility, albeit at higher prices. If EGA or Hercules isn't critical in your situation, the BoB/MG is a very good value. The BoB/16 is also impressive if the software you use supports its high-resolution modes.

PC MAGAZINE FACT FILE

BoB/MG
BoB/16
Persyst Products
Emulex Corp.
3545 Harbor Blvd.
Costa Mesa, CA 92626
(800) 854-7112
(714) 662-5600 (in Calif.)
List Price: BoB/MG, $249; BoB/16, $699
In Short: The BoB/MG provides color, monochrome, and color on a monochrome monitor with gray shading; the BoB/16 generates 16-color, high-resolution images. The BoB/MG is attractively priced. Both work well.

CIRCLE 466 ON READER SERVICE CARD

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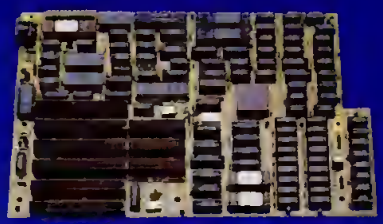


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CIRCLE 209 ON READER SERVICE CARD

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■ NEW ON THE MARKET ■ PAUL M. STAFFORD

IBM's New Proprinter XL: Enhanced Print Features In a Wide-Carriage Unit

IBM has introduced the Proprinter XL, a wide-carriage version of its popular Proprinter 200-character-per-second nine-pin serial dot matrix printer.

The Proprinter XL adds a series of enhancements to the original Proprinter, like support of proportional spacing and of double-high and double-wide printing for charts, overhead transparencies, and other display copy. The XL is rated 3 decibels quieter than the original Proprinter, and also features a "quiet mode" that cuts noise further by reducing print speed to 40 cps. Rated at up to 200 cps in draft and 40 cps in near-letter-quality modes, the XL weighed in at 111 and 30 cps, respectively, on PC Magazine Labs benchmark tests. The $549 Proprinter rates 91 and 30 cps.

Two of the Proprinter XL's best new features are an electronic "easy loading" paper mechanism (an especially useful device when inserting wide tractor-fed paper) and a front panel that lets you select print enhancements and options previously accessible only through software.

List Price: $799. **IBM Information Systems Group**, 900 King St., Rye Brook, NY 10573; (800) IBM-2468.

CIRCLE 463 ON READER SERVICE CARD



IBM's $799 Proprinter XL is a wide-carriage version of its $549 Proprinter. The machine features electronic paper feed and a front panel that lets you select print modes.

Alpha Data Claims Fast Access for Multiple-Head 520-Mbyte Hard Disk Drive

Alpha Data Inc. of Chatsworth, Calif., has announced a 520-megabyte external Winchester drive that moves 76 read/write heads over four 14-inch disk platters to provide a claimed average access time of under 18 milliseconds. The Atlas 520 features automatic park and lock at power-off, can be chained together to enable a full gigabyte of storage, and weighs about 100 pounds.

List Price: $10,850. **Alpha Data Inc.**, 20750 Marilla St., Chatsworth, CA 91311-4488; (818) 882-6500.

CIRCLE 448 ON READER SERVICE CARD

Flash-Up Windows Lets Programmers Easily Create, Edit Windows

Program developers should note The Software Bottling Company's release of *Flash-Up Windows*, a tool for developing and editing windowed screens for programs in most languages.

Users can open windows created by *Flash-Up Windaws* automatically through program calls or through assigned keystrokes. Applications include adding help and menu screens to commercial and in-house software.

List Price: $75. **Requires:** 256K RAM, one disk drive, DOS 1.1 or later. **The Software Bottling Co.**, 6600 Long Island Expwy., Maspeth, NY 11378; (718) 458-3700.

CIRCLE 460 ON READER SERVICE CARD

Virtual Memory Manager Claimed to Load Ten 640K Programs at Once

SoftLogic Solutions of Manchester, N.H., has introduced *Software Carousel*, a virtual memory manager that it claims can load up to ten 640K programs simultaneously, using the mainframe trick of trading RAM onto disk space. Previous PC virtual-memory managers have required expanded RAM; *Software Carousel* works with as little as 256K bytes of standard RAM.

List Price: $49.95. **Requires:** 256K RAM, hard disk drive, DOS 2.0 or later. **SoftLogic Solutions Inc.**, 530 Chestnut St., Manchester, NH, 03101; (603) 627-9900.

CIRCLE 449 ON READER SERVICE CARD

HOT PROSPECT

Datacopy Jetreader and Jetreader Plus Digitize Both Text and Graphics Data

Datacopy, of Mountain View, Calif., announced two digitizing systems that combine the functions of graphics scanners and optical character readers.

The Jetreader and Jetreader Plus both turn paper graphics and characters into machine-readable data that you can edit with *OCR*-series and *WIPS* software that Datacopy provides with the units. Both offer selectable graphics scanning resolution of either 200 or 300 dots per inch, which result in claimed scan times of 28 and 43 seconds per page, respectively. Images can be displayed on-screen or merged into word-processed documents.

The difference between the Jetreader and the Jetreader Plus is that the Jetreader Plus, in conjunction with *OCR Plus* software, can be programmed to accept nearly any 10- or 12-pitch monospace type style.

List Prices: Jetreader, $2,950; Jetreader Plus, $3,250. **Datacopy Corp.**, 1215 Terra Bella Ave., Mountain View, CA 94043; (415) 965-7900.

CIRCLE 464 ON READER SERVICE CARD

Jetreader combines the functions of a 300-dpi graphics scanner and an optical character reader.



Multifunction Cards from OmniTel, Boca Research: Modem and Video Added

Two manufacturers have introduced multifunction boards that go a step beyond the usual functions. OmniTel's Omnipak adds a Hayes-compatible 1,200-bit-per-second modem, while Boca Research's Memek card includes a color/monochrome graphics adapter.

The Omnipak features up to 384K bytes of RAM, parallel, serial, and game ports, and a clock/calendar with battery backup. There is a speaker on the card for monitoring calls, and OmniTel throws in RAM-disk, printer spooler, and communications software with the package.

The Memek card also comes with the usual ports, clock/calendar, and utilities, and adds up to 2 megabytes of LIM EMS–compatible expanded RAM. Its video modes emulate both Hercules's and Plantronics's monochrome graphics modes, as well as IBM's color/graphics mode, all without setting DIP switches or jumpers.

List Price: Omnipak, $499. **OmniTel Inc.**, 5415 Randall Pl., Fremont, CA 94538; (415) 490-2202.

CIRCLE 462 ON READER SERVICE CARD

List Prices: Memek with 256K RAM (64K-bit chips), $645; with 1M-byte RAM (256K-bit chips), $795; 1-Mbyte RAM daughterboard, $345. **Boca Research Inc.**, 6401 Congree Ave., Boca Raton, FL 33431; (305) 997-6227.

CIRCLE 461 ON READER SERVICE CARD

PC Designs EGA Card Emulates Four Standards, Breaks Price Records

PC Designs of Tulsa, Okla., has introduced a half-sized EGA card that could stimulate a price war among the industry's price-competitive graphics card manufacturers. The PC Designs EGA, built around the Chips and Technologies EGA chip set, emulates IBM's Enhanced Graphics, Color/Graphics, and

(continued on next page)

New on the Market

(continued from preceding page)

Monochrome Display adapters and lists for $299. The PC Designs EGAPlus adds Hercules-compatible monochrome graphics and goes for $325. Both cards come with 256K bytes of graphics memory and feature 1-year warranties.

List Prices: PC Designs EGA, $299; PC Designs EGAPlus, $325. **PC Designs Inc.**, 5837 S. Garnett, Tulsa, OK 74147; (918) 252-5550.

CIRCLE 455 ON READER SERVICE CARD

Paradise Systems Debuts Graphics Card, Single-Chip Multidisplay Adapter

Paradise Systems of San Francisco, Calif., is on a video rampage.

The Paradise Hi-Res Graphics Card is a half-length card that emulates four video cards: IBM's Color/Graphics and Monochrome, Hercules's Graphics Adapter, and Plantronics's ColorPlus cards.

Those who embrace the EGA standard will be excited by Paradise's single-chip EGA implementation. Called the PEGA 1, the chip also handles IBM monochrome and color modes, as well as Hercules monochrome graphics, Plantronics ColorPlus color graphics, and Paradise mono graphics modes. The chip was not commercially available at the time of publication but Paradise says it should be available soon to the OEM market.

List Prices: Hi-Res Graphics Card, $299; PEGA 1, under $40 OEM. **Paradise Systems Inc.**, 217 E. Grand Ave., South San Francisco, CA 94080; (415) 588-6000.

CIRCLE 454 ON READER SERVICE CARD

STB Systems Combines Three Graphics Modes On Single Add-In Card

STB Systems of Richardson, Tex., has unleashed the Chauffeur HT, a board that combines monochrome and color graphics modes with Hercules monochrome graphics and Tseng Labs' Ultrapak 132 132-column-text emulation, as well as IBM color and mono modes.

List Price: $349. **STB Systems Inc.**, 601 N. Glenville, #125, Richardson, TX 75081; (214) 234-8750.

CIRCLE 453 ON READER SERVICE CARD

SQZ! Compacts Lotus Files

Turner Hall Publishing has introduced *SQZ!*, a memory-resident utility that compacts *1-2-3* and *Symphony* worksheet (.WKS) files to as little as 5 percent of their original size on save to disk and expands them on loading.

SQZ! is compatible with all releases of *1-2-3* and *Symphony* and features password encryption for file security.

List Price: $79.95. **Requires:** 30K RAM, *1-2-3* or *Symphony*. **Turner Hall Publishing**, 10201 Torre Ave., Cupertino, CA 95014; (408) 253-9607.

CIRCLE 447 ON READER SERVICE CARD

dBASE III Plus Workalike Has Extended Features

WordTech Systems of Orinda, Calif., is offering a *dBASE III Plus*–compatible database management system with extended programming-language features, new on-line help and menu systems, and no copy protection for the budget-compatible price of $169. *dB XL* is designed for full compatibility with WordTech's *dBASE III Plus* compilers and can be used by unlimited users on a single-server network with the addition of the $99 *Networker* program.

List Price: *dB XL*, $169; *Networker*, $99. **Requires:** 256K RAM, two disk drives, DOS 2.0 or later. **WordTech Systems Inc.**, P.O. Box 1747, Orinda, CA 94563; (415) 254-0900.

CIRCLE 450 ON READER SERVICE CARD

Five Modems from Four Companies Come in All Speeds and Sizes

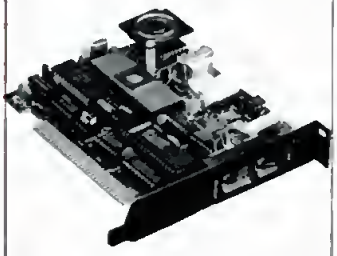
If you're in the mood for modems, this has been a good month for you. Four companies—Anderson Jacobson, Prentice, MultiTech Systems, and Anchor Automation—introduced five modems, ranging from external 1,200-bit-per-sec-ond to half-slot internal 2,400-bps models. All are compatible with the Hayes AT command set.

Anderson Jacobson's AJ 2400-T is a 2,400-bps unit that has claimed compliance with all domestic and international communications standards.

MultiTech Systems' MultiModemPC3 is a half-length internal 1,200/300-bps modem that comes with *MultiComPC* communications software.

Prentice Corp. introduced two 2,400-bps units, the standalone P-224, and the internal half-card POPCOM 2400.

Anchor Automation's Signalman LIGHTNINGi is a half-length internal 2,400-bps modem that is bundled with Norton-Lambert's *LYNC* communications software.



Anchor Automation's $499 Signalman LIGHTNINGi fits the functions of a 2,400-bps modem onto a half-slot card.

List Price: AJ 2400-T, $695. **Anderson Jacobson**, 521 Charcot Ave., San Jose, CA 95131; (408) 263-8520.

CIRCLE 459 ON READER SERVICE CARD

List Price: MultiModemPC3, $299. **MultiTech Systems Inc.**, 82 Second Ave. S.E., New Brighton, MN 55112; (612) 631-3550.

CIRCLE 458 ON READER SERVICE CARD

List Prices: P-224, $695; POPCOM 2400, $595. **Prentice Corp.**, 266 Caspian Dr., Sunnyvale, CA 94088-3544; (408) 734-9810.

CIRCLE 457 ON READER SERVICE CARD

List Price: Signalman LIGHTNINGi, $499. **Anchor Automation Inc.**, 6913 Valjean Ave., Van Nuys, CA 91406; (818) 997-7758.

CIRCLE 456 ON READER SERVICE CARD

Amdek, Zenith Introduce New High-Resolution RGB Color Monitors

High-resolution color monitors from A to Z are appearing on the market, as both Amdek and Zenith introduce RGB displays specially designed to be used with the latest professional-graphics-quality video controller cards.

Amdek Corp.'s Color 730 is compatible with IBM's Professional Graphics Controller. The Color 730 can display up to 256 colors at a time from a 4,096-color palette in 720 by 840-pixel resolution, and carries a 2-year parts and labor warranty (there is a 3-year parts warranty on the CRT).

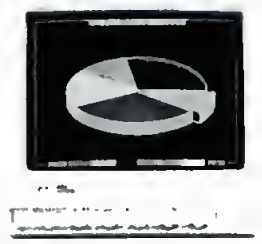
Down at the other end of the alphabet, Zenith Data Systems has announced its ZVM-1360 monitor that works with the Tecmar Graphics Master video controller. The ZVM-1360 generates 16 colors in 640 by 480 pixels in the noninterlaced mode, and 640 by 240 in interlaced mode. PC

List Price: Color 730, $1,099. **Amdek Corp.**, 2201 Lively Blvd., Elk Grove Village, IL 60007; (312) 364-1180.

CIRCLE 452 ON READER SERVICE CARD

List Price: ZVM-1360, $799. **Zenith Data Systems**, 1000 Milwaukee Ave., Glenview, IL 60025; (312) 842-9000.

CIRCLE 451 ON READER SERVICE CARD



Zenith Data Systems' $799 ZVM-1360 monitor can produce 640- by 480-pixel resolution when used with Tecmar's Graphics Master display card.

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Introducing the only software product that even comes close to the capabilities of Javelin. The Javelin Trial Pack.

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CIRCLE 265 ON READER SERVICE CARD

PopDrop Removes Resident Programs from PC Memory

PC FIRST LOOK

At a bargain-basement price, *PopDrop* manages greedy memory-resident programs that compete for your PC's often overloaded RAM.

BY CHARLES PETZOLD

It's a familiar story: you've gorged out on memory-resident programs again. You've stuffed inside your computer's memory a RAMdisk, a print spooler, a keyboard macro utility, a calculator, a spelling checker, and a calendar to make appointments through the year 2000. Now it's time to run your spreadsheet program, and you find that you have only 64K bytes of RAM left.

It sounds like your bloated memory needs *PopDrop*, the software equivalent of an Alka-Seltzer. *PopDrop* is a bargain utility from InfoStructures that automatically removes resident programs from memory and frees the space for other programs. *PopDrop* is faster than a reboot, easier to use than *SideKick*, and considerably less expensive than an expanded memory board.

A nicely designed on-disk tutorial shows you how to use *PopDrop*. In addition, there's a diagram showing what's happening in your machine's memory. Before you load resident programs, just execute the Popdrop command and hit Enter. Now load your resident programs as usual. When you later need more memory and want to extract the resident programs, execute the Popdrop Down command and press Enter. That's the simplest way to use *PopDrop*, but you have some other options.

Load by Layers

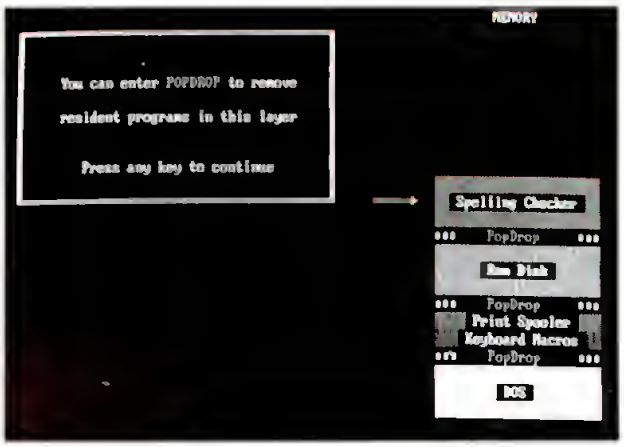
PopDrop also allows you to load your memory-resident programs in layers and remove them a layer at a time, starting with the most recent program loaded. For instance, start off by executing the Popdrop command, load some memory-resident programs, run the Popdrop Up command to start a second layer, and load some more resident programs. A Popdrop Down command removes the second layer of resident programs, but the first layer is still active. A second Popdrop Down command removes the first layer.

Only 1,500 Bytes

PopDrop manages these amazing feats of memory manipulation in just 1,500 bytes of elegant assembly language code using documented DOS calls. A Popdrop Up command (or just Popdrop when starting off) saves all the interrupt vectors and remains resident in memory. It does not, however, intercept any interrupt vectors or mess around in any other way. On the Popdrop Down command, *PopDrop* steps segment-by-segment through the memory from the end of the last Popdrop Up command up to the current segment, calling DOS to deallocate each allocated memory block. If a particular segment is not the beginning of an allocated memory block (and most will not be), no harm is done. If it is, then another resident program has just been removed from memory.

Of course, this method is not perfect. The documentation warns about batch files that may stop executing after a Popdrop Down command is executed from within the batch file. (DOS keeps the name of an executing batch file in an allocated memory block and can't find it if the *PopDrop* program deallocates that space.)

PopDrop allows you to load your memory-resident programs in layers and remove them a layer at a time with the Popdrop Down command, starting with the most recent program loaded.



An easy-to-use menu guides users through PopDrop, *a $19.95 utility that removes memory-resident programs from memory when you run short on space.*

Application Admonitions

It is also essential not to run a Popdrop Down command from within a "run a program" option of an application (*Microsoft Word*, *Symphony*, *1-2-3* (Release 2), *XyWrite II Plus*, *Framework*, and *WordStar*) or while running a secondary command processor. In this case, *PopDrop* will deallocate the memory used by the application. This won't be immediately apparent but may eventually cause a crash. You should also avoid using *PopDrop* to remove resident programs that use Lotus/Intel/Microsoft expanded memory because the expanded memory will not be freed. But these are minor problems and easily avoided.

The *PopDrop* disk also comes with a demonstration program showing off InfoStructures' *Fact Cruncher*, a $99.95 outline/idea processor. Is *PopDrop* merely a crafty way for InfoStructures to get the *Fact Cruncher* demonstration program on your PC? Perhaps. But even so, *PopDrop* is a much-needed utility to manage memory-resident programs and a real bargain at $19.95.

PC MAGAZINE FACT FILE

PopDrop
InfoStructures Inc.
P.O. Box 32617
Tucson, AZ 85751
(602) 299-5962
(602) 323-4600 (orders)
List Price: $19.95, plus $3 shipping
Requires: DOS 2.0 or later.
In Short: A utility to remove memory-resident programs from RAM when you need to regain memory. Unbeatable value for the money. Not copy protected.

CIRCLE 469 ON READER SERVICE CARD



A Hard Drive The Easy Way.

Turn your PC into an XT in seconds with OnBoard, Maynard's new hard drive card!

So your PC needs a hard drive...

When you bought your PC, you never dreamed you'd need more than floppy drive performance. But now, both you and your PC are ready for more. In fact, there's just one reason you've been putting off getting a hard drive. Admit it. It's the installation. Cables and controller and all that.

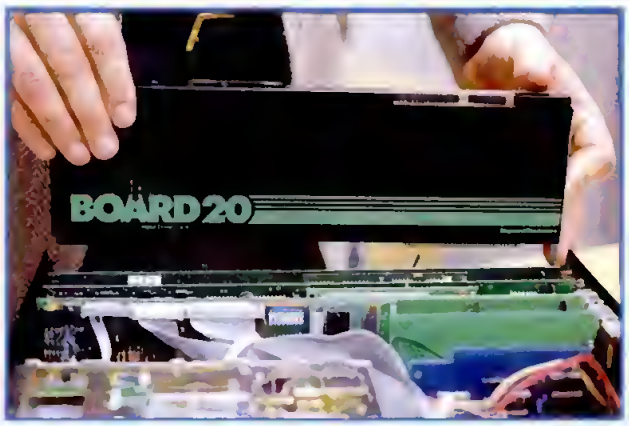
Well, relax. OnBoard is here. The hard drive card that boosts your PC's storage capacity to rival any XT or AT* on the block! OnBoard snaps easily into one of your IBM PC's expansion slots! Open your PC, plug in OnBoard, and close your PC. Just like that. Your PC will boot directly to OnBoard when you power up — no more floppy disk maneuvering.

Powerful Self-Control.

If you already have a hard drive in your PC, OnBoard's controller card will double up and run both hard drives. Which helps keep your expansion slots open for other business.

Lots of Head Room, Lots of Desk Room.

OnBoard puts up to 20MB of power into your PC, turning it into a hard drive heavyweight in seconds! If you need less storage but the same speed and fine performance, you can install OnBoard 10.



Single-Slot Installation.

Simply snap OnBoard into expansion slot 1 of your IBM PC* or XT, leaving all your other slots free for additional boards.

OnBoard is designed to work in today's leading PCs and is available at the finest computer stores. Contact your local dealer or call us today for more information.

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CIRCLE 478 ON READER SERVICE CARD

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PROBLEM: The more experience your hard disk has, the harder it has to work.

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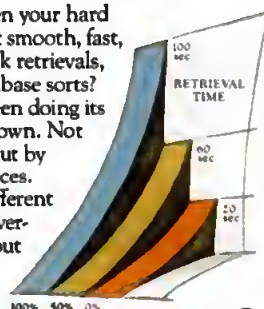
Your hard disk will run faster when it's not chasing around after files.

Remember the old days when your hard drive was new? Remember that smooth, fast, slick performance? Those quick retrievals, rapid saves, lightning-like database sorts?

Well ever since, DOS has been doing its best to slow your hard drive down. Not by slowing down the motor, but by breaking your files up into pieces. Storing different chunks in different places. Data files, programs, overlays and batches that started out in one seamless piece are now scattered all over.

Loading is slower. Sorting is slower. Retrieving, backing-up. Everything takes longer because your disk has to work harder.

Problem is, it's something that happens so gradually you may not notice the difference. At least, not until you see the dramatic improvement after using Disk Optimizer.



File fragmentation—It's a problem you can see.

Watch your hard drive the next time it reads or writes a file. Each "blip" of the LED means the drive-head is moving to another place on the disk—either to pick up or lay down another chunk of data.

And the truth is, head movement takes time. Far more time than actual reading and writing. What's worse, all this head movement causes extra wear and tear that can shorten the life of your drive.

Disk Optimizer—Tunes up your disk by cleaning up your files.

Disk Optimizer works by finding all the scattered pieces of your files and putting them back together where they belong. Next time your drive reads it, there's just one place to look.

And the results are often dramatic. Reading and writing times may be cut by as much as two thirds. Database sorts that used to take hundreds of head moves now proceed quickly and efficiently. And since head movement is now at an absolute minimum, your disk drive will lead a longer, more productive life.

Analyze, scrutinize, optimize.

Before you optimize, you'll probably want to analyze. So Disk Optimizer shows you, in percentages, how much fragmentation has taken place—on the entire disk, in individual directories, or for groups of files you specify using global or wildcard names.

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*plus $5.00 shipping and handling.

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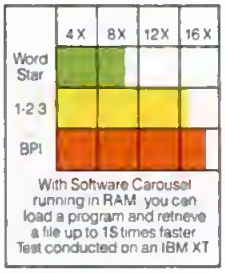
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Now you can keep up to 10 programs loaded and ready to run.

Hard to believe, but some people are happy with just one kind of PC software. Well, this is not a product for them.

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With up to ten different programs at your fingertips, you'll have instant access to your database, communications, spelling checker, spreadsheet, word processor, RAM resident utilities, languages, anything you like.

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This could be the best reason ever for owning an expanded memory card, like the Intel Above Board, AST RAMpage, or any card compatible with the L/I/M Extended Memory Standard.

Software Carousel puts programs into this "high-end" memory for temporary storage when they're not in use. And switches them back out when you want them. It's fast, efficient, and easy.

If you want, Software Carousel will even use your hard drive for swapping. Just allocate a portion for storage, and go to work.

Sidekick, Superkey and Ready. All at the same time.

You know what happens if you try loading two or more RAM resident utilities at once. You get crashed keyboards, frozen screens, all kinds of interference between programs fighting for control.

With Software Carousel, you can have as many accessories and utilities on-tap as you want. Just load different ones in different Carousel partitions. Since they can't see each other, they can't fight.

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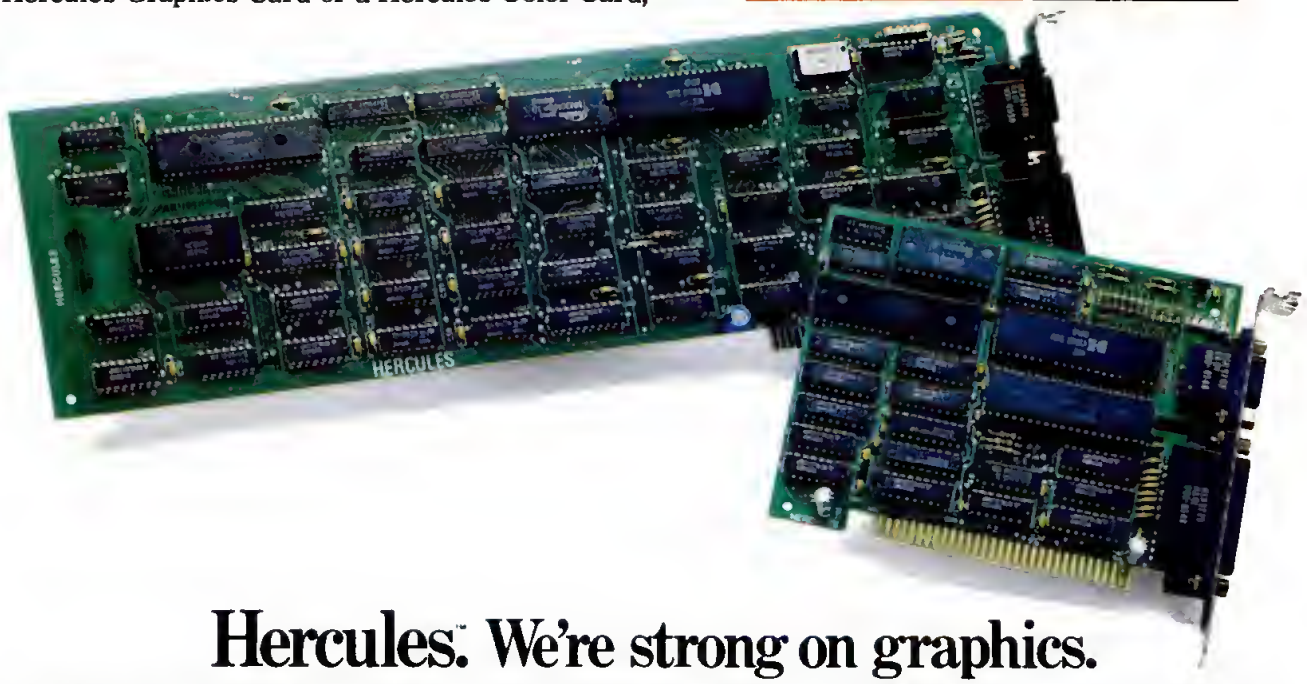


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Trademarks/Owners: Hercules/Hercules Computer Technology; IBM/IBM. Offer valid in the United States, U.S. Territories and Canada from May 1 through August 31, 1986. Rebate application, accompanied by Purchaser Registration Card and dated sales receipt must be sent to Hercules Rebate Offer, PROMARK Depot, P.O. Box 3947, Milford, CT 06461-0397 no later than September 15, 1986. Applications received after that date will not be honored. Rebate will be paid in the same currency in which the card was purchased. Offer void where prohibited, taxed or restricted. Dealers are not eligible to claim rebate. Offer limited to one rebate per product serial number and original Purchaser Registration Card. Each rebate must be applied for on an individual basis. Other application constitutes fraud. Rebate offer applies to Hercules Graphics Card (model GB102) and Hercules Color Card (model GB200). Other Hercules products are not eligible. Allow 6-8 weeks for redemption. **For additional information in the United States call (800) 532-0600 ext. 700. In Canada call (800) 323-0601 ext. 700.**

CIRCLE 140 ON READER SERVICE CARD

Graph-in-the-Box: Pop Goes the Easel

PC FIRST LOOK

BY WINN L. ROSCH

Graph-in-the-Box lets you add graphics to the long list of memory-resident functions that are only a keystroke away. Press a two-key combination at any time—the default combination is Alt-G but you can customize it to reflect your own preference—and *Graph-in-the-Box* goes to work, drawing charts of difficult-to-conceptualize data either on-screen or on paper.

Creating a chart with *Graph-in-the-Box* is easy. The whole system is controlled by a menu that pops onto the screen. Submenus let you select among 11 different chart styles, including ordinary bar charts (the default), stacked horizontal or vertical bar charts, line charts, and a pie chart. Other submenus allow you to adorn your chart with captions and titles.

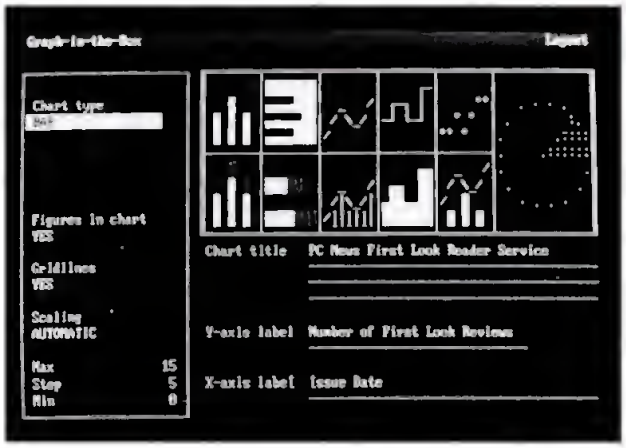
Normally, the first thing you'll want to do is select the data to graph. You have two choices: entering numbers directly or selecting the data from the screen by marking the information the same way you would mark a block of text with a word processor.

After you make your menu selections, the graph appears almost immediately on-screen. (On an AT, drawing a bar chart takes under 2 seconds.) If you like it, you can also print the chart in one of three sizes. Because *Graph-in-the-Box* does not advance paper before or after it prints, you can even use the program to insert graphics in the middle of another print job.

A setup program lets you configure *Graph-in-the-Box* for the more popular graphics printers (including IBM, Canon, Epson, Hewlett-Packard, Okidata, and Seikosha), plotters (Epson, Hewlett-Packard, Facit, and Hitachi), and display types and adapters (IBM Color/Graphics and Enhanced Graphics adapters, Hercules, and Tecmar Graphics Master).

The biggest question about *Graph-in-the-Box* is not whether the product works as advertised—it does so amazingly well—but whether anyone really needs memory-resident graphics. Those who don't will still find *Graph-in-the-Box* easier to use than almost any other graphics software, particularly with its block approach to selecting the data it uses.

And if you need a visual look at your data *right now*, *Graph-in-the-Box* will fulfill your most impatient desires—along with carving 129,584 bytes (I counted them) out of your system's memory for its own purposes and cluttering you hard disk, should you have one, with its *Softguard* copy-protection scheme.



Graph-in-the-Box's layout menu offers a selection of 11 different chart styles, including bar, stacked horizontal, stacked vertical, line, and pie charts.

PC MAGAZINE FACT FILE

Graph-in-the-Box
New England Software
Greenwich Office Park 3
Greenwich, CT 06830
(800) 633-2252 ext. 300
List Price: $97.60
Requires: 128K RAM, DOS 2.0 or later.
In Short: Memory-resident graphing software that can be evoked within other applications. Offers 11 chart styles and is compatible with a wide variety of printers, plotters, and display adapters. Copy protected.

CIRCLE 465 ON READER SERVICE CARD

Hayes Internal Modem Reduced to Half-Card

PC FIRST LOOK

BY WINN L. ROSCH

When Hayes Microcomputer set out to update its best-selling 1200B internal modem, the company applied a hard-won lesson from its Atlanta neighbor, Coca-Cola: don't mess with success. In trimming the industry-standard modem to less than half its previous size, from 13 to 5 inches long, Hayes kept it functionally identical. Like its full-length predecessor, the half-slot 1200B recognizes exactly the same set of AT-prefixed commands; automatically dials, answers, and/or sets its speed to 1,200 or 0 to 300 bits per second; and monitors the telephone line for carrier, dial tone, and busy signals.

Hayes says the full-slot 1200B has been discontinued but will be available while inventory is depleted.

Custom VLSI Chips

The big shrink was earned with Hayes's first application of custom large-scale integration chips in a PC product. The only other design innovation in the new 1200B was moving the DIP switches to the back panel so that their settings could be altered without removing the top from the computer. Two little-used switches (Bell versus CCITT v.22 selection and pulse dial break level) have been de-

(continued on next page)

> In trimming the industry-standard modem to less than half its previous size, from 13 to 5 inches long, Hayes kept the Smartmodem 1200B functionally identical to its full-length predecessor.

PC MAGAZINE FACT FILE

Smartmodem 1200B
Hayes Microcomputer Products
P.O. Box 105203
Atlanta, GA 30348
(404) 441-1617
List Price: $489 (or $549 bundled with *Smartcom II*)
Dimensions: Expansion card 5 inches long by .835 inches thick
In Short: Hayes downsizes its 300/1,200-bps internal modem to a short-slot card. Flawless performance, of course. Despite VLSI chips, no reductions in price or power consumption.

CIRCLE 467 ON READER SERVICE CARD

■ PC UPDATE ■ PAUL M. STAFFORD

Compaq announced price cuts on its existing models, as well as new versions of its Portable II and Deskpro machines. While prices on the **Portable** and **Portable Plus** remained stable at $2,199 and $3,199, respectively, prices on fully configured (640K bytes of RAM, 20-megabyte hard disk, and 10-megabyte tape backup) **Portable 286**s dropped 12 percent, from $6,999 to $6,199. **Deskpro 286**s with 512K RAM, 30-megabyte drives, and 10-megabyte tape backup were reduced 15 percent, from $6,699 to $5,699, and Deskpros with 256K RAM and 10-megabyte hard disks were cut 10 percent, from $2,644 to $2,399. Other versions of these models also received price cuts.

Compaq also introduced new versions of the Portable II and the Deskpro. The new **Portable II, Model 4**, will feature a 20-megabyte hard disk and list for $4,999, up $200 from the 10-megabyte **Portable II, Model 3**. An updated **Deskpro, Model 3**, will also include a 20-megabyte drive and will sell for $3,144. Were the cuts in response to IBM's recent cuts on PCs and ATs—up to 8 percent on floppy disk units and 12 to 26 percent on hard disk machines? Compaq says the new prices reflect current industry trends and pave the way for the new machines.

* * * * *

Three other PC-compatible manufacturers announced price cuts on their IBM-compatible lines. Zenith sliced its AT-compatible **Z-100** with 512K bytes of RAM and 20-megabyte hard disks from $5,599 down to $4,449 and its 10-megabyte XT-compatible **Z-158** from $3,699 to $2,799.

Hewlett-Packard cut the AT-compatible, 20-megabyte **Vectra** 11 percent, from $5,473 to $4,893. Hot on the heels of its announcement of the 80286-based **ITT Xtra XL**, ITT sliced 30 percent off the price of the AT-compatible **Xtra XP**. With 512K RAM and a 20-megabyte drive, the XP now sells for $3,495, down from $4,965.

Also, Tandy Corp. has added a version of the **Tandy 3000** with a 35-megabyte hard disk drive and 640K RAM to its product line. At $4,499, the new 3000 costs 16 percent less than an IBM PC AT with a hard disk. Tandy's 20-megabyte hard disk 3000 with 512K RAM continues at $3,499.

* * * * *

The copy-protection wars rage on. At the same time it ran ads stating "We are not copy protected," Brown Bag Software added copy protection to its ***Brown Bag Word Processor*** and ***Brown Bag File Recovery System***. Customers who bought directly from Brown Bag weren't told of the change; to get the unprotected versions, they had to pay an extra $20. Sandy Schupper, president of Brown Bag, declined to comment, but he agrees that ads promising unprotected software ran while the company was selling copy-protected software.

* * * * *

Graphics Software Systems (GSS) of Beaverton, Ore., has introduced a specification it hopes will become a standard in PC graphics. The **Direct Graphics Interface Standard (DGIS)** is a hardware spec for graphics controller boards that will allow maximum performance while maintaining maximum software compatibility. Hardware manufacturers will be able to incorporate the DGIS spec with a ROM chip, while software support will be achieved through device drivers. Ashton-Tate, Lotus, and Software Publishing have all agreed to support DGIS with their software, while Intel, Texas Instruments, Paradise, and Chips and Technology have all chipped in on the hardware side. GSS hopes to introduce the first DGIS-based hardware at Fall Comdex and to market DGIS ROM chips at a later date. A booklet outlining the DGIS hardware and software spec can be had for $25 from GSS, P.O. Box 4900, Beaverton, OR 97005-7161; (513) 641-2200.

* * * * *

In brief: Thoughtware Inc. dropped prices on its series of sales-support software. ***Lightyear***, ***Trigger***, and ***Sell! Sell! Sell!***, which sold for $295 to $495 each, will now sell for $99 each. For more information, contact Thoughtware at 2699 S. Bayshore Dr., Coconut Grove, FL 33133; (305) 854-2318...Software Research Technologies (SRT) has released Version 5.1 of its ***SmartKey*** macro processor. The new version will sell for $59.95 and will include new features like Hercules and EGA graphics support, DOS functions, and increased printer control. Contact SRT Inc. at 3757 Wilshire Blvd., #211, Los Angeles, CA 90010; (213) 384-5430...General Optimization Inc. has announced Version 1.1 of ***What's Best***, an optimization package that automatically generates the best-possible solutions to spreadsheet models. The new release will support ***1-2-3***, Release 2, and ***Symphony***, Version 1.1, as well as earlier versions.

* * * * *

PC Update reports on software and hardware enhancements. To contribute, write or call PC Magazine, *One Park Avenue, New York, NY 10016; (212) 503-5251.*

Hayes Modem

(continued from preceding page)

leted, leaving four: port selection (COM1 or COM2), telephone jack selection (RJ-11, -41S, or -45S versus RJ-12 or -13), carrier status detection, and DTR operation. The functions of the deleted switches are now handled exclusively through software commands.

At just shy of 0.9 inches thick—the fattest part of the board is the black plastic cover over the large (for internal modems) speaker—the 1200B is a tight, though workable, fit in XT expansion slots. As should be expected, the new modem works straight from the box and shows the high quality that Hayes is known for. No "engineering change orders," those tiny wire jumpers that mark places where mistakes were made in board layout, mar the product.

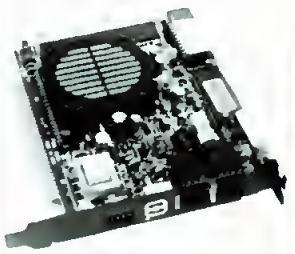
Power Consumption

Usually smaller boards bring a couple of additional benefits— reduced power consumption and reduced price. Alas, the new 1200B does not vary from its predecessor in either area. Because its circuitry is implemented in comparatively power-hungry NMOS (n-channel metal oxide semiconductor) technology, it drains roughly the same amount of electricity from its host as the older full-length 1200B internal modem, according to Hayes vice president of sales Garry Betty.

Premium Pricing Retained

Despite the smaller board and lower parts count that should push down manufacturing costs, and intense competition from other half-length Hayes-compatible modems priced as low as $160, Hayes clings to its previous list price for the 1200B, $489 alone or $549 bundled with *Smartcom II* communications software, which has not been altered.

Explains Betty: "We believe that our product is positioned in the marketplace as a premium board modem for the IBM PC and compatibles. Regardless of what our price is, there will always be a market for low-priced clones."



Through use of VLSI chips that pack the functions of several chips into one, Hayes's $489 1200B now takes up just a half slot, perfect for use in an XT or with half-slot cards that take up two slots.

The price of power just went down.



Before you buy DBase III, QuickCode and Clipper, look at TAS-Plus

TAS-Plus just made it faster, easier and cheaper to build database applications.

TAS-Plus combines the power of a Relational Database with the ease of a Program Generator. Then TAS-Plus adds a Runtime Compiler to produce lightning-fast finished code.

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CIRCLE 472 ON READER SERVICE CARD

Videotrax Backs Up Hard Disk on VCR

PC FIRST LOOK

The marriage of VCR technology and the need to back up data has produced a new system.

BY WINN L. ROSCH

The Alpha Microsystems' Videotrax tape backup system offers a clever route to hard disk backups: a videocassette recorder using readily available videocassette tapes.

At the heart of the system is a full-size expansion card—the $595 Video Tape Backup Controller—that is mounted inside PCs and compatibles and does the data-to-video conversion. It drives any VHS or Beta VCR, including an optional Sharp VCR specially modified by Alpha Microsystems to let the controller start and stop the tape.

An Extra 20 Megabytes

The easily understood Videotrax backup software, included with the system, allows both image and file-by-file backups, but only one backup session per tape. A videotape could hold 80 megabytes of data; by comparison, streaming tape cartridges that cost $25 hold 60 megabytes.



Alpha Microsystems' Videotrax backs up hard disks to inexpensive videocassettes.

As a tape backup system, the Videotrax is slow, requiring about 1½ minutes per megabyte of data backed up. Because a single error or dropout that would not be catastrophic to a video frame could wipe out an entire data file, the Videotrax uses cyclic redundancy error-checking and automatically makes multiple copies to ensure data integrity.

The Videotrax system can be programmed to make backups unattended, so that no productive work time need be wasted.

An Unlikely Tax Dodge

An illusory advantage of the Videotrax is the ability to use one videocassete recorder for both hard disk backups and entertainment—and deduct the cost of the VCR as a business expense. However, tax law says you can deduct such expenses only in proportion to the time the device is put to business use. To the extent that you're an honest taxpayer, your business deduction will probably be severely limited.

Alpha Microsystems' $800 Videotrax VCR offers little incentive for such a strategy, ranking only toward the lower end of VCRs. It's just a two-head VHS unit that might cost $200 to $300 retail. The mechanism uses a drag brake for tape tension instead of the more robust multiple motor design. It's not last year's technology, but the year before last's. There's no provision for improving audio quality, no stereo, no noise reduction, and no remote control.

The price of the Videotrax controller and recorder is competitive with other tape backup technologies, and if you keep a vast library of backed-up data, the media savings may be important. But it's probably wise to think of it only as a business tool—not as a tax dodge or great entertainment. PC

Because a single error or dropout that would not be catastrophic to a video frame could wipe out an entire data file, the Videotrax uses cyclic redundancy error-checking and automatically makes multiple copies to ensure data integrity.

Downloading Data from Satellite or Cable

Once a digital signal has been converted to the standard video format, it can be stored, manipulated, and transmitted like any other video signal. According to Alpha Microsystems, these computer data-turned-video signals have important applications: they can be broadcast like ordinary television pictures both over cable and by satellite.

Higher Data Rates

Through the use of Alpha Microsystems' scheme of video modulation, data rates are much higher than with modem-based data systems—60K bytes per second. The company is working with major telecommunications companies to develop a system through which large blocks of computer data can be delivered or broadcast at high speed anywhere a satellite signal can be received.

The major advantage of this system is compatibility. Circuits to handle video signals are ubiquitous. Data-modulated video is thus an expedient way to develop high-speed computer communications systems. Such systems can be implemented immediately.

But the Alpha Microsystems' system has its drawbacks, too. The Alpha Microsystems technique is far from an optimum means of transmitting data; it also wastes substantial (and, in satellite transmissions, valuable) bandwidth. It may be a short-term alternative rather than a long-term data communications solution. —*W. L. R.*

PC FACT FILE

Videotrax
Alpha Microsystems
3501 Sunflower
P.O. Box 25059
Santa Ana, CA 92799
(714) 957-8500
List Price: Controller board, $595; Videotrax VCR, $800.
Requires: DOS 2.0 or later.
In Short: Videotape backup system with both image and file-by-file software options; it can be used with any VCR or optional Alpha Micro machine.

CIRCLE 542 ON READER SERVICE CARD

No other video adapter revs up as much software, drives as many monitors, or fine tunes as many graphics.

STB Systems has just combined the technology of the industry's five most popular video display adapters: the IBM Color Graphics and Monochrome/Printer Adapters, the Hercules Graphics Card™, the Tseng UltraPAK-S™, and the STB Chauffeur™.

With the new Chauffeur HT™, the world's best graphics capabilities are at your service.

Roll through any software.

The Chauffeur HT lets you use any and all standard CGA or MGA compatible software. No preboot software or special drivers are needed.

Drive a fleet of monitors.

With The Chauffeur HT, you can emulate any color graphics software, producing 16 shades of gray on any IBM compatible monochrome monitor. CGA 200 line graphics modes are expanded to a full-screen format. Text is displayed as high resolution 8 X 14 characters.

The Chauffeur HT displays Hercules compatible software at 720 X 348; it provides a 1024 X 348 display mode for the CAD/CAM market, and a crisp 132 column display for spreadsheet and terminal emulation users.

Using any standard RGB color monitor or Enhanced Graphics display, you can produce monochrome quality text while maintaining high resolution, 16 color graphics. Even Hercules compatible software can be produced on enhanced monitors.

Enjoy the extras.

In addition to giving you greater graphics capabilities on a wider range of monitor types, with a wider selection of software,

The Chauffeur HT gives you a standard parallel printer port, an optional clock/calendar, a light pen interface support, PC Accelerator software, and full compatibility with the IBM PC, XT and AT.

	STB Chauffeur HT	STB Chauffeur	Tseng Labs UltraPAK-S	IBM Color Graphics Adapter	Hercules Graphics Card
COMPATIBLE MONITORS					
Enhanced Graphics Display	Yes				
RGB Color Display	Yes		Yes		
Monochrome Display	Yes	Yes		Yes	Yes
25 Line Display	Yes				
MODE COMPATIBILITY					
IBM Monochrome Display	Yes	Yes		Yes	Yes
IBM CGA	Yes	Yes	Yes		
Hercules Monochrome Graphics	Yes			Yes	Yes
132 Column Display	Yes				Yes
OTHER FEATURES					
Parallel Printer Port	Yes	Yes		Yes	Yes
Runs all CGA, MDA Hercules Compatible Software (no drivers required)	Yes				
Clock/Calendar	Optional	Optional			Yes

Honk for more information.

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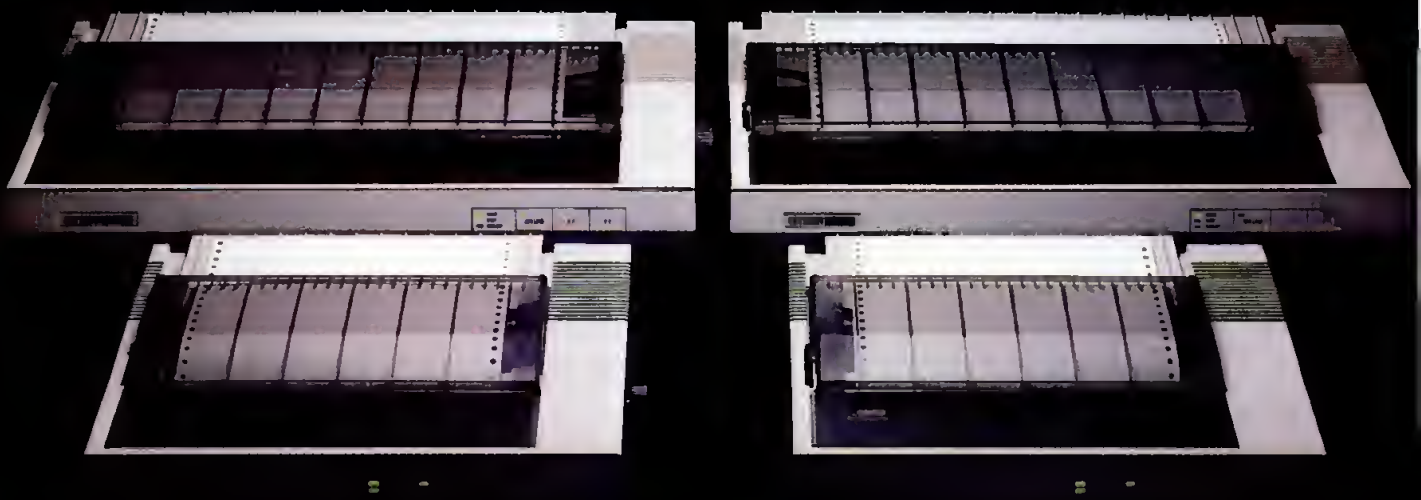
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IBM LANs Reach Deeper Into Corporate Computing

PC ANALYSIS

BY FRANK J. DERFLER, JR.

NEW YORK—IBM's April 16 LAN announcements on new interfaces and features for the Token Ring and PC Networks mean better interaction with the most widely used IBM minicomputers and mainframes. In addition, there is good evidence that Big Blue's marketing plan is to use local area networks to sell more of its bigger hardware.

If you have a System 36 minicomputer, it will cost you about $4,000 plus $600 to $1,500 per workstation plus the cost of a dedicated PC AT to put the System 36 on the Token Ring LAN. This investment allows PCs to use the System 36's virtual storage, printing, and data-transfer capabilities and to work through the System 36 to a System 370 mainframe. The added workload caused by a large group of attached PCs is likely to require some upgrading of both the 36 and the 370, but if you are going to share resources you must have enough to go around.

Similarly, the venerable IBM Series/1 gains a $6,600 interface to both the Token Ring and PC Network. The flexibility of the Series/1 as a communications interface should make it a welcome addition to many corporate LAN architectures, but the Series/1 needs a minimum of 1 megabyte of main memory, 200 megabytes of disk, and an upgrade to the operating system (not included in the $6,600) before it can do LAN work.

Life in the PC Network

In an interesting move, IBM will provide a way for the baseband PC Network to operate on a channel of the broadband industrial MAP network. PC Network certainly isn't dead. Its salvation may be in serving as a way for PCs to access the communications capabilities of the Series/1 in manufacturing plants.

If you have a 3725 Communications Controller in front of your 370 mainframe, a $30,000 investment (plus $475 per PC) allows you to connect the mainframe to as many as eight Token Ring networks simultaneously. If you thought your older 3704 or 3705 Controller might carry you into the LAN world, it won't. But IBM will give you a 15 percent discount on a new 3725 until October.

Other April 16 announcements—network repeaters good for more than a mile, diagnostic software, and new LAN cables for industrial applications—also show that IBM is serious about using LANs as gateways to the big Big Blue hardware.

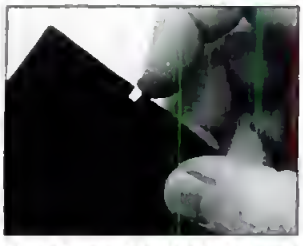
■ COMMUNIQUÉS ■ EDITED BY BILL HOWARD

Fantastic Claims Department Part I

The Floppy Stopper Co. invented floppy disks with sliding plastic "switches" that replace write-protect labels.

The company says the on/off write-protect switches avoid the biggest problem of disks, which is, the write-protect tabs either stick too well or not at all.

They're $16.50 per box of ten disks (P.O. Box 53268, Baton Rouge, LA 70805; (800) 222-7867). While other disk makers may use "ridiculous, sometimes dishonest claims" for their wares, Floppy Stopper says, its users can "expect to increase the usable life of their disks through reduced handling by as much as 75 percent."



Floppy Stopper disks ($16.50 per box of ten) have "on/off" switches instead of write-protect tabs.

Just Another Frosh Until She Smiled

When 14 Brown University students staged a sit-in at IBM's Providence, R.I., offices to protest IBM's business dealings with South Africa, Big Blue called the men in blue and had the 14 Ivy League students arrested for trespassing on the corporation's property.

Then IBM learned one of the 14 wasn't just another Brown freshman, but ex-first-daughter Amy Carter, and it asked that the charges be dropped. Why? "For business reasons," an IBM spokesperson semiexplained.



Fantastic Claims Department Part II

A dubious comment from Randy Cassingham, author of *The Dvorak Keyboard* (Freelance Communications, P.O. Box 717, Arcata, CA 95521; $12.95 plus $1 shipping): "I think Qwerty [the standard keypad letter arrangement] is seeing its last days."



The Dvorak keyboard: the wave of the future or just wave it good-bye?

Fantastic Claims Department Part III

Beethoven would have been "five or six times more prolific" if he'd been alive today and using a personal computer, says Steven Newman, manager of a 243-page research study on computer-aided publishing by International Resource Development Inc. of Norwalk, Conn.

If Ludwig used an IBM PC, he'd probably be running the *Personal Composer* from Passports Designs of Half Moon Bay, Calif., Newman contends, and he would have cranked out 50 symphonies, not just 9.

Product Name Of the Week

La Cage à File, a $19.95 plastic-coated wire rack, with handle, for carrying five boxes of floppy disks, from Travacomp International (5300 Audubon, #302, South St. Paul, MN 55075). It's $29.95 with five empty plastic disk boxes.



Travacomp International's La Cage à File, a $19.95 disk box caddy.

Illustration: Martha Gradsaker; Photograph (Floppy Stopper): Thom O'Connor

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Word Perfect (Ver 4.1)	196
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Wordstar Pro Pack 3.31	233
Wordstar 2000 2.0	233
Wordstar 2000 Plus 2.0	278

GRAPHICS/MICE

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Diagram Master	199
Energraphics	159
Energraphics w/Plotter Option	205
In-A-Vision	249
Microsoft Buss Mouse	107
Microsoft Chart	169
Microsoft Serial Mouse	119
News Room	32
PC Draw	199
PC Mouse w/Dr. Halo II	104
PC Mouse w/Paint Plus	119
PFS: Graph	76
Printmaster	30
Print Shop	33
Signmaster	134
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SPREADSHEETS

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Pascal Compiler (Microsoft)	174
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Fastback	87
Gem Collection	109
Gem Desktop	27
Keyworks	49
Microsoft Windows	57
Norton Utilities 3.1	48
PC Tools	19
Printworks	36
Prokey 4.0	69
Sidekick	30
Sidekick/Superkey Bundle	71
Sidekick (Unprotected)	47
Sideways 3.1	34
Superkey	39
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XTree	27

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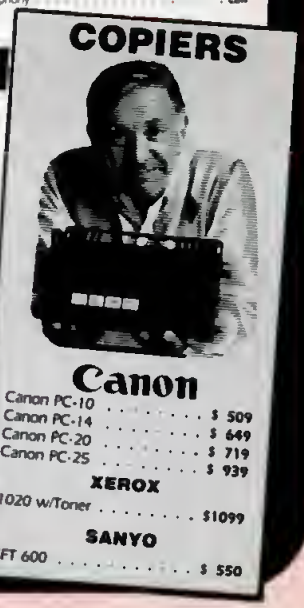
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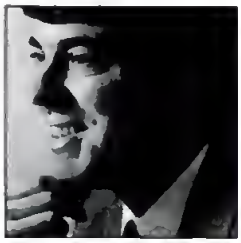
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■ FROM THE EDITOR'S SCREEN ■ BILL MACHRONE

THE MORE THE MERRIER



Nowhere is free enterprise more alive and well than in the software side of the PC market. But we must judge products on their merit, not on their sales potential.

We call them "blockbusters"—those humongous issues that devote their larger part to a single topic. We've recently covered (working backward) investment software, word processors, and, of course, printers.

Why do we do them? Because it isn't easy. (Before you accuse me of rampant egotism, let me explain.) It isn't easy for us, and it isn't easy for you. We provide a service that isn't available anywhere else at any price. To do that, we have to start more than 6 months before the issue shows up in your hands. We design our testing scripts and debug them. We line up machines, products, writers, and project managers. Then we pilot-test to make sure everything will go as planned. Finally, we get down to the detailed testing. All that's left then is to organize the results into something that will be useful to you.

When we finally publish the issue, we get lots of mail. Our readers are nothing if not opinionated. Most of the correspondence is complimentary; some takes issue with our methodology. But invariably, one curmudgeon asks why we bothered.

"I'm not interested in printers/investment software/word processors," goes the complaint. "I was so bored. I missed the usual variety, the interesting articles I've come to expect from *PC Magazine*."

The one time I dignified such a gripe with a reply, I said that *PC Magazine* is very much like the weather in Iowa: wait a couple of weeks and it'll change.

Of course, if *PC Magazine* were a monthly, there's no way we could do blockbusters. A month is too long to wait for the varied coverage you require to stay abreast of this industry. Because of our frequency of publication, however, we can afford to devote the occasional issue to a single topic.

DISTURBING TREND I can take the passing criticism from readers. We're not trying to please all the people all the time. What bothers me, though, is that some other magazines would have you believe it is somehow enough to review the top three or half-dozen products.

"Go with the winners" is a popular attitude, but not here. Let's face it: this is no small-potatoes market anymore. It takes millions of dollars even to get noticed, and that's no guarantee of success. Like the movie that's much hyped or critically acclaimed and still flops at the box office, it takes more than a big budget or good reviews to make a winner.

Size, too, is no predictor of performance. Although some of the products that sell well today are unimpeachable, some frankly don't deserve to. Some of them have lived past their prime. Others never had a prime—just no competition.



New products have few forums and fewer still that allow comparison to the market leaders. We're proud to be the biggest showcase and the one that has opinions about the products, too.

It's interesting to see some of the mental blocks people have against new products. Even in user-group meetings, those forward-thinking bastions of independence, I've been asked why we don't publish financial data on the software publishers or hardware manufacturers. This is like going out on a date, enjoying it, then asking for references before you go out again.

What good would it do to know that the software vendor has 2 or 20 or 200 employees? Size is no guarantee of longevity: big companies do fail and small companies do prosper. Technical support is most important when you are learning the program, updates are important only if features have been left out. Buy the program on its merits, not its parents. Or maybe we should exclude the little ones from our reviews. What the heck, they can't afford to advertise, so nobody will miss 'em, right?

FREE ENTERPRISE Wrong. If Horatio Alger were alive today, he'd be in the computer business. Without mooning over all the garage companies that grew to giants, it's clear that nowhere is free enterprise more alive and well than in today's software PC market. But even brilliant

Illustration, Karen Stolper

■ FROM THE EDITOR'S SCREEN

products need exposure. The mighty oak from a tiny acorn grows, but without a little sunlight, it's not going anywhere.

We see brilliant new ideas every week. For instance, Turner-Hall's *Note-It* touched off a flurry of activity and accolades because it lets you annotate *1-2-3* spreadsheets quickly and efficiently. We've since seen a new product, *Smart Notes* from Personics, that embodies the same basic idea but generalized: it's the electronic equivalent of Post-its for your screen. It works with virtually all programs, not just your spreadsheets. We've even seen a program, *What's Best*, that turns *1-2-3* and *Symphony* into a front end for an optimization system that uses linear programming techniques. Now not 1 businessperson in 200 understands linear programming, but this product makes the technique so accessible that any decision maker who can build a spreadsheet will be able to use it.

The energy and creativity of these authors is amazing. Only one of these programs comes from a company of any size, but all three will be successful in their markets because they address themselves to real needs of real users. You can bet that we'll include them in any roundup we do of the *1-2-3* add-on market. *Smart Notes* may well be the next *SideKick*, and *What's Best* may never make the best-seller charts, but we'll judge both products on their merits, not on their sales potential.

NO SOAP You'll recall that before we got into this business the largest comparison test ever done was the *Consumer Reports* test of 60 shampoos. We squeaked past that one with 66 database managers. Then we blew it away with 120 printers, 13 networks (which were considerably harder to test than 120 printers), and another 70 printers. Then we knocked off 57 word processing programs and 48 investment software packages. Soon, we'll look at about 130 more database managers.

Even in nonblockbuster articles, we try to err on the side of completeness. For instance, in PC Lab Notes we tell you how to get things out of DOS that you never thought possible. Then we list and briefly describe all the commercial products we can find that do similar things, in case you're disinclined to do it yourself. Sure, we could save time and effort just listing the market leaders, and we wouldn't make one small manufacturer mad at us because it was inadvertently left out. (The anger of the manufacturer is inversely proportional to the number left out.) But that's not our style.

Blockbusters are no picnic. Hey, if it were easy, everybody'd be doing it. Besides, we stand on our records.



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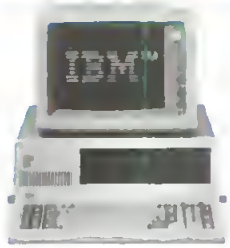
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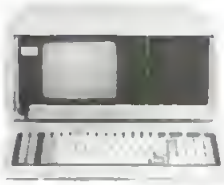
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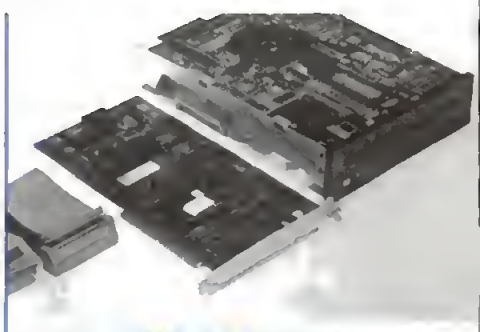
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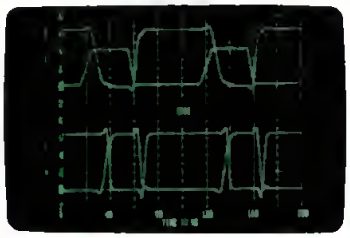
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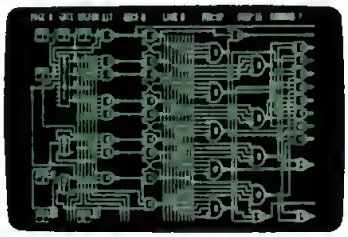
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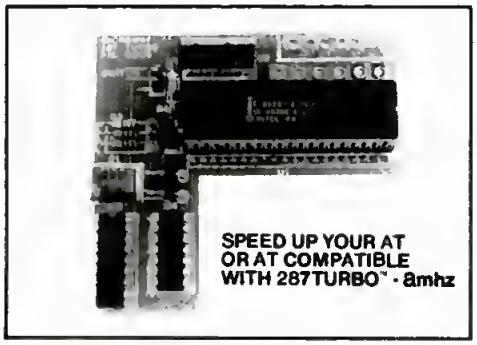
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If you don't know much about hard disk partitions, you're not alone. Norton explains how to set up a raw disk and create a partition table.

Hard disks are hardly rare on personal computers anymore; for example, in a recent survey, our sister publication, *PC Tech Journal*, found that 85 percent of its readers have hard disks at work or home. While hard disks bring a lot of extra capability to our PCs, they also bring new problems (every silver lining has its black clouds).

One of the complications hard disks create for PCs is something that I'd bet relatively few users are even aware of, let alone understand—hard disk partitions. Therefore, I thought I'd devote a few columns to giving you a practical understanding of them. Like nearly everything else connected with your PC, it's worthwhile to know about partitions for three different reasons: the first is simply the pleasure and satisfaction of knowing more about this marvelous machine; the second is that the more you understand, the better you can benefit from the PC's capabilities; the third and ugliest reason (gulp) is that the more you understand, the better you can deal with hard disk disasters. And dealing with partition disasters can be rather tricky, as you'll see.

THE ABCs OF PARTITIONS Let's start off our discussion with the basics. All standard hard disks for personal computers are set up so that they can be divided into more-or-less independent sections called partitions.

Each partition is a section of the hard disk that is roped off to act separately and independently from any other partitions. In order to do this, a hard disk has a partition table, stored in its first sector, that records basic information about any partitions on the disk.

A disk's partition table has room for four partition entries, allowing the disk to have up to four partitions. (If the table were larger, you could have more partition entries, but there really doesn't seem to be any need to subdivide any disk further.) Each entry in the table records whether or not there is a partition number (1, 2, 3 or 4) and, if so, its size, location, and type (more on this in a future column).

DOS'S FDISK You can glimpse the partition information that's recorded on your hard disk by using the FDISK program that comes with DOS. Activate FDISK and choose item 4, "Display Partition Data," from its menu and you'll see a semitechnical summary of part of the information that's recorded in the partition table. (In a future column, I'll discuss just what FDISK shows you and what it can do with your disk.)



Illustration: Karen Stolper

While you can use partitions to subdivide your disk into autonomous sections, *if you need to*, mostly you don't. This is why most hard disks have just one partition that occupies all the space on the disk. And that's why most users are happily unaware of partitions.

The reason for having partitions on a disk is that a hard disk is big and, as IBM puts it, fixed. When you're working with floppy disks, you're not working with a critical resource—you can switch disks in a jiffy and use different disks for different purposes. Hard disks are another story.

OTHER OPERATING SYSTEMS For one thing, even if you're a dedicated DOS user, you might still want to work with one of the other operating systems for the PC—such as IBM's version of UNIX, known as PC-IX—so there has to be a way to accommodate more than one operating system on a hard disk. Operating systems need their own independent disk space; partitioning allows you to give different operating systems separate chunks of the same hard disk.

Most users, though, don't work with anything other than DOS and don't anticipate ever having to use another operating system on their personal computers. (Who knows what the future will bring, but it looks like DOS will reign king of the PCs until things change a great deal.) But even if you use DOS, there's another reason to have more than one partition on your hard disk. DOS can't work with a disk any larg-

■ PETER NORTON

er than 32 megabytes because of an internal design feature that limits it to handling that amount of disk space; this is the so-called 32-megabyte barrier that I discussed many months ago in this column (see "Breaking the Barrier," Volume 4 Number 14).

But just glance through any issue of *PC Magazine* and you're sure to find advertisements for hard disks larger than 32 megabytes. In fact, the IBM PC AT is designed to accommodate 14 different sizes and shapes of hard disks, with six of them, comprising nearly half the list, exceeding DOS's 32-megabyte limit. So how do you get DOS to work with a hard disk that is bigger than 32 megabytes? You set up a DOS partition to be a 32-megabyte or smaller section of the disk. To take advantage of the rest of the disk, you then set up a second DOS partition and have DOS treat the two partitions as different hard disk drives, which are logically independent even if they are physically attached to each other. There are some very interesting complications in doing all of this, which I will get into in another column. I'm just mentioning the idea of having two (or more) DOS partitions on the same hard disk to show you that you can make use of hard disks that are bigger than 32 megabytes, despite the so-called 32-megabyte barrier.

■ You can glimpse the partition information that's recorded on your hard disk by using DOS's FDISK program and choosing item 4 from its menu.

SOME GROUNDWORK Let's see how to set up a raw disk and create a partition table.

When a disk, whether it is a hard disk or a floppy disk, is formatted, two types of formatting are going on: low-level (or physical) formatting and high-level (or logical) formatting.

Low-level formatting involves laying out the disk's sectors, which are the recorded magnetic records on the disk. This key step must be performed before any data can be written to or read from the disk. High-level formatting involves setting up



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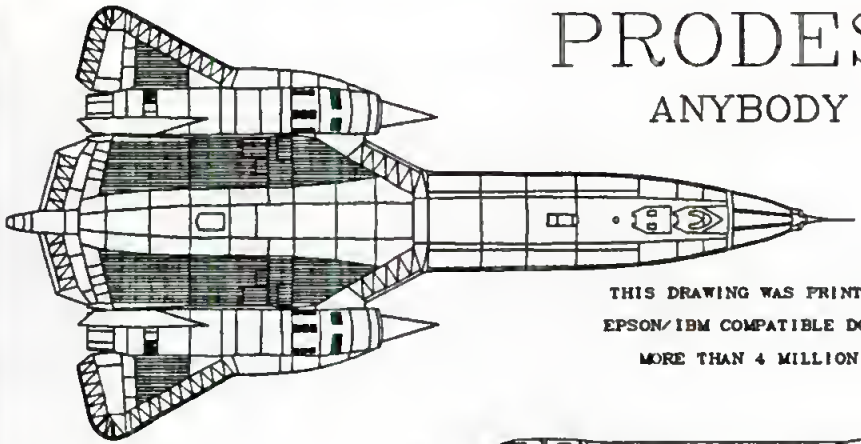
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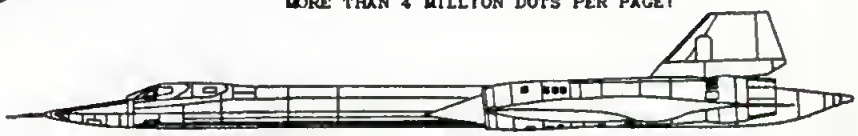
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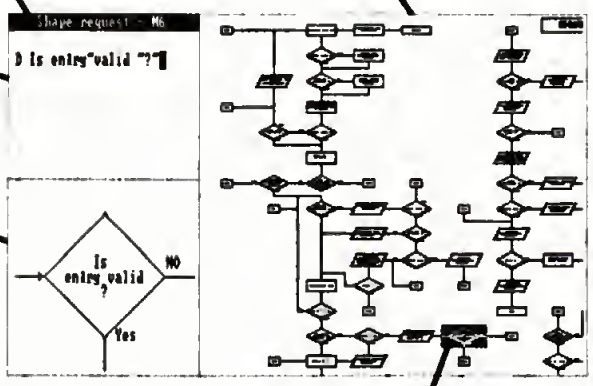
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the disk's logical structure, such as the directory that DOS puts on every disk.

As it turns out, the familiar DOS FORMAT command performs both types of formatting with floppy disks. On hard disks, however, this command does only high-level formatting. Hard disks customarily come with the low-level formatting already done, and none of the operations that you normally do with your disk have anything to do with low-level formatting. (That doesn't mean that you can't do the low-level formatting. IBM's Advanced Diagnostics program disk includes the software to do a low-level format, and some hard disks' BIOSes include a low-level format routine that you can access through DEBUG.)

■ IBM's Advanced Diagnostics program disk includes software for a low-level format.

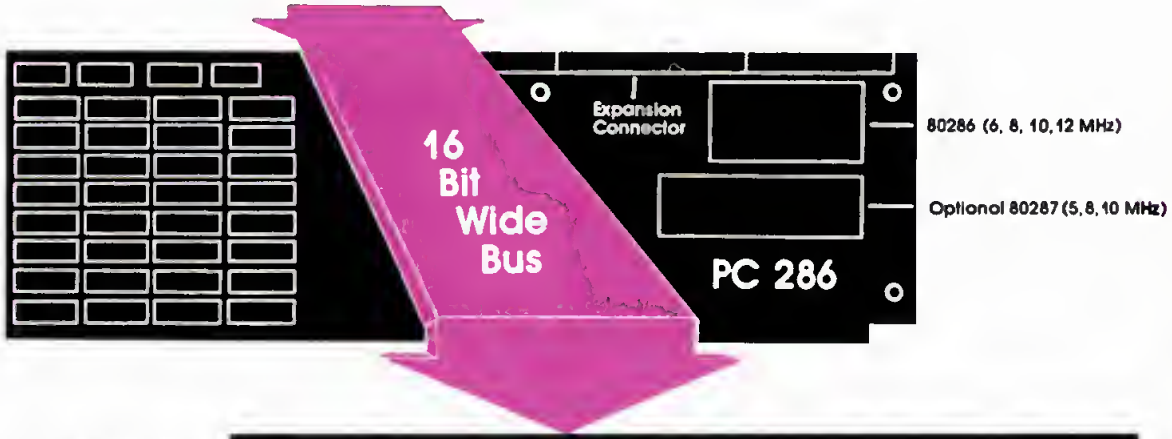
The low-level format operation sets up some of the most basic characteristics of the disk, such as the sector size (which is always 512 bytes per sector, but which could be other sizes, from 128 to 1,024 bytes). The low-level formatting also sets the interleaving factor (a complex subject that I've touched on from time to time in past columns). For a hard disk, the low-level formatting also places one key logical item on the disk besides the raw formatted sectors. This is the blank partition table that prepares the disk for the next step, the creation of partitions.

While you don't ordinarily get involved in the low-level formatting, you can carve up your disk into partitions. The high priests of DOS put the necessary tools in your hands to look at, work with, and (unfortunately only to a partial extent) create and change partitions, thanks to the facilities of the FDISK program. Working with FDISK (or its equivalent for other operating systems) is the next step in the layered topic of hard disk partitions. I'll dive into it in the next issue.

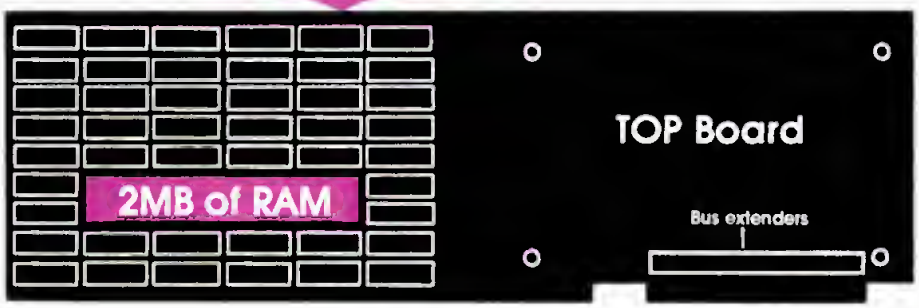
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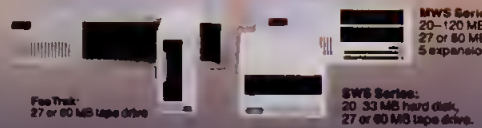
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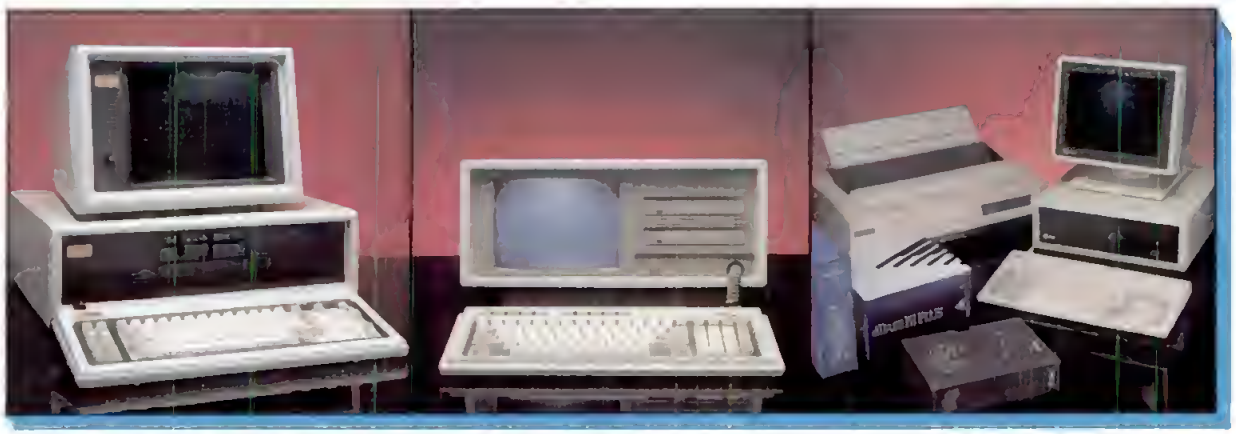
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ADVISE AND CONSENT



It's about time PC "writing programs" took a more active role in helping us get words onto paper. The program should advise; we give consent.

"We wish to inform you that we are in receipt of yours of the eleventh inst., in re the. . . ."

Do you know many people who still write like that? I don't. Though I confess I sometimes long for that kind of innocent, simpleminded clumsiness when I'm wading through the day's batch of computer-generated form letters that begin, in best Californese, "Hi, Jim! Is this the day you'll decide to get behind the idea of getting rich?"

Word processing software has made a lot of people better writers, forcing them to confront the awkwardness of that kind of stylistic obsolescence. Using a word processing program on a PC has given people who craft letters, reports, novels, church newsletters, book-club solicitations, and maybe haiku more confidence at the keyboard, allowing them to get in touch with whatever levels of clarity of thought and personal expression were lurking inside them.

But existing programs don't really help us write better so much as permit it. It's a passive process: the program lets you put in a word here, delete a sentence there, and shuffle paragraphs around—but it doesn't go out of its way to help you. You advise; it consents.

AN ACTIVE ROLE It's about time PC "writing programs" got around to taking a more active role in helping us get words onto paper. Software should advise; then we consent.

The new interactive, on-line spelling checkers are an important but small step. *Turbo Lightning* and *Reference Set* lurk in the background and watch over your shoulder as you type. By comparing what flows from your keyboard with a RAM-resident dictionary, they guess that this or that word may be misspelled and beep or boop to catch your attention.

With a keystroke you can ask the program to double-check the word against its larger disk-resident dictionary, and if the word's still unknown, to put up on-screen a short list of the words the program suspects you really meant to type.

That's a nice feature, which finally brings a level of interactivity to the process.

Many people, myself included, dislike all that erratic beeping and booping, finding it intrusive when we're trying to think. Fortunately, the program I use, *Lightning*, lets users turn off the autoproofing function and make use of the dictionaries only to check the spelling of the words we choose to check.



More useful by far is the thesaurus function available with these programs. Tapping Alt+F6 when I want a synonym for a word is a powerful and genuinely helpful feature—a taste of the power inherent in the idea of writing on a computer.

But that's still not nearly enough. We need programs that catch failures to close parentheses and quotes; punctuation errors; split infinitives; subject-verb disagreement; mistakes in tense; clichés; trite, redundant, and sexist constructions; excessive use of passive voice; and more.

AN EARLY ATTEMPT Those with long memories will recall *Punctuation and Style* from Oasis, which was an early effort from the CP/M days (now available for PC/MS-DOS machines) to bring computer power to text cleanup. *P&S* still looks pretty good, given the paucity of competition.

I've been working lately with *RightWriter*, a more comprehensive writer's tool kit. It writes to screen, disk, or printer a copy of your document, with comments and suggestions for improvement dropped into the text. It flags long sentences, passive voice, comma mistakes, and many more problem areas.

RightWriter also assigns a "readability index," indicating the grade level the program believes readers must have attained to fully understand the copy. And on a 0.0 to 1.0 scale, it calculates a "strength index" indicating forcefulness, a "descriptive index" showing excessive use of ad-

Illustration: Karen Stolper

■ JIM SEYMOUR

jectives, and a "jargon index" focusing on obscure lingo.

It's a useful program, if more attuned to everyday business writing than creative work.

HERE'S THE BEEF But these Hamburger Helpers for writers suffer from an after-the-fact approach. Writing tools should let us choose any of three approaches, two of them interactive.

First, a "looking over your shoulder" mode, with beeps to alert us to problems and pop-up boxes to resolve them.

Second, an "on-demand" mode, allowing users to call up help from within their word processing program and document, to confirm the choice of a word or phrase or to get help with a problem.

And third, the kind of after-the-fact approach of most current spelling checkers and writing tools, with an existing file processed by the program to on-screen or paper reports.

UNIX users have probably been chuckling since these first paragraphs. When Bell Labs was concocting UNIX, it included *Writers Workbench (WWB)*, a set of programs that handle—though mainly after the fact—many of these jobs.

■ The thesaurus available with some programs is a powerful and genuinely helpful feature—a taste of the power inherent in the idea of writing on a computer.

Part of the delay in moving these tools to the MS-DOS world has been the memory problem. Absent a solution to the 640K-byte RAM barrier or a fast virtual-memory swap, we can't have all these tools on-line. But the 640K-byte wall will soon crumble.

Beyond the technical problem, a misapprehension that has held back development of such tools is the idea that the market for them is small—consisting of no more than a few thousand cheapskate "creative" writers.

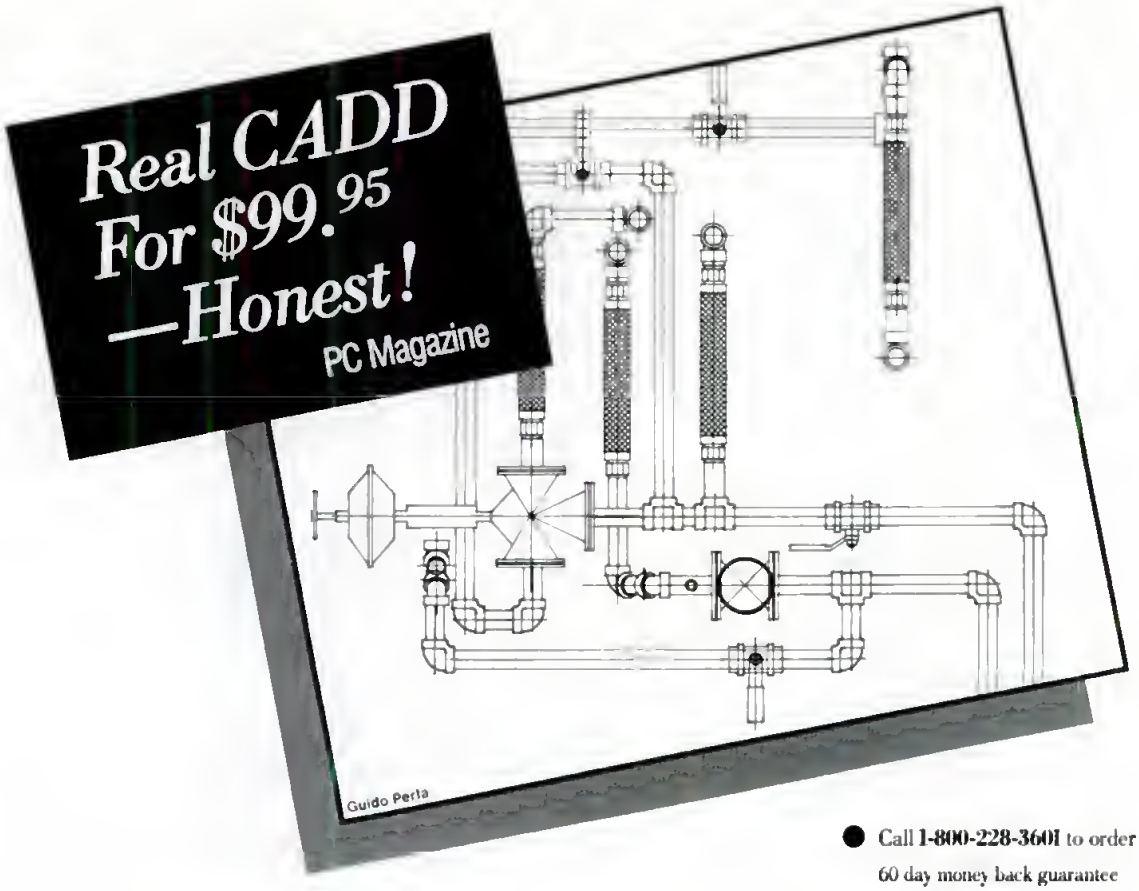
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■ STEPHEN MANES

ARTIFICIAL STUPIDITY



Why do big brains screw up so often? There's no percentage in producing a perfect Version 1 when you can soak customers for a new, improved Version 2.

"Can you keep a secret?" asked my friend Morton, the financial researcher.

"Depends on the secret."

"This could mean my job. You promise you won't go public with this?"

"Only to my readers."

"Fine. Neither one works here. You remember when I told you to put your money into Artificial Intelligence?"

"How could I forget?" In a matter of weeks, Morton's sage advice had transformed my meager fortune into a royal pittance.

"OK. Now we've got a bigger scoop." He paused for dramatic effect. "Artificial Stupidity."

"Is the world really ready for that?" I wondered.

"It's not pie in the sky, by and by, when you die, like AI," Morton assured me. "It's here now: the wave of the present."

"Prove it."

TOO MANY ROTTEN APPLES "Just look at the computer products you see. Don't you ever wonder why so many are so rotten?"

"Often," I admitted.

"Even the good stuff has bugs the size of bats and aspects that are just mind-boggling in their stupidity. Take Lotus, for instance. I can't begin to tell you how many times people around here have lost files by accidentally exiting *1-2-3* without remembering to save their work. Or by saving the new version as a replacement just before they realized their latest change screwed everything up. Or by retrieving a file before saving the old one."

"Around here, too."

"I mean, people complain about word processors without undo features, but *1-2-3* doesn't even let you make backup files automatically. Heck, even Stone Age *WordStar* is smart enough to know you've got unsaved text and even makes a backup of your last version. But that's just the tip of the iceberg."

"What's underwater?"

"You must see it all the time. Programs that insist you use the Tab key instead of the cursor keys to move the cursor. Hardware that does everything but the one thing you want it to. Help when you don't need it, no help when you do. You know the litany."

"Sometimes I think I wrote it."

"Well, we decided to find out why this keeps happening. It just didn't seem to make sense."



"It makes plenty of sense if you've got a misanthropic weltanschauung."

"I had a misanthropic dachshund, but I got sick and tired of the lawsuits. Anyhow, just think about it: the people who develop computer products aren't stupid. They're the ones who knew how to wire up the classroom so they could give your 4th-grade teacher an electric shock from the back of the room while you were still trying to figure out the least common denominator. In college they were the ones who were blissed out from their profits in the drug trade while you were trying to dope out the first three sentences in Kant's *Prolegomena*."

"True."

"So why do these big brains screw up so often?"

"A certain degree of human frailty, perhaps?"

"That's what we thought at first," said Morton. "Wrong. Ever hear of Stupitech?"

"Wasn't that a pre-Incan civilization?"

"It's a company that's making money hand over fist. It's the number one firm in Artificial Stupidity research."

"What exactly does it do?"

SABOTAGE BY STUPITECH "It began as an executive placement and training outfit. Let's say you want to sabotage one of your competitor's newest products. You go to Stupitech, and they get one of their guys into the enemy camp. The mole from Stupitech is a walking time bomb. He plants erroneous formulas in all the spreadsheets, patches false scenarios into deci-

Illustration Karen Stolper

■ STEPHEN MANES

sion-support software, and makes databases lose important information. It's called Artificial Stupidity."

"I thought software and hardware did all that right off the shelf."

"These guys go further," Morton said. "And they don't just stop there. Say the competitor's arranged a big meeting about ways to fix speed problems in a new program. The Stupitech mole shows up with a set of phony color transparencies that prove speed is a concern to only a fraction of 1 percent of customers. Say a program's getting too big to run on most personal computers. The Stupitech guy will report that removing all the error-trapping code won't affect the macho power user. Stupitech's 'Rexpert' system's the one that confidently predicted IBM's success in winning the Internal Revenue Service's contract for laptops."

"Impressive," I admitted.

"You said it. Some companies have even hired Stupitech for their own internal reasons. There's no percentage in producing a perfect Version 1 when you can soak your customers big for a new, improved Version 2. And retaining a sprinkling of bugs keeps customers tied to your umbilical. We suspect Stupitech had a hand in Release 2 of *1-2-3* from both sides, but nobody's talking."

"It does make some sense."

"Well, now they're ready to pounce. They're going in big for Artificial Stupidity software."

"Like what?"

"The hottest thing ready to roll is code-named Hermit Crab. It gets inside all these silly operating-environment shells and keeps them from isolating you from your work."

"Sounds as though it'd be dynamite on the Macintosh," I noted.

REAL 2001 STUFF "That's just the intro product. They figure a lot of people are going to get downright furious when all the AI stuff that comes to market runs slower than molasses and keeps guessing wrong about what you really want to do. Their lead program will selectively disable some of the 'brain cells' and give speed and control back to the user. Kind of like what Keir Dullea did to HAL in *2001*. That one's code-named Lobotomy."

A light bulb went on over my head. "Let me ask you something. Do you think Stupitech was involved in producing the PC*jr*?"

"Don't be naive. No matter how much the technique is refined, computers can never be as stupid as human beings. And when it's something on the scale of the PC*jr*, you know you're looking at *real* stupidity."

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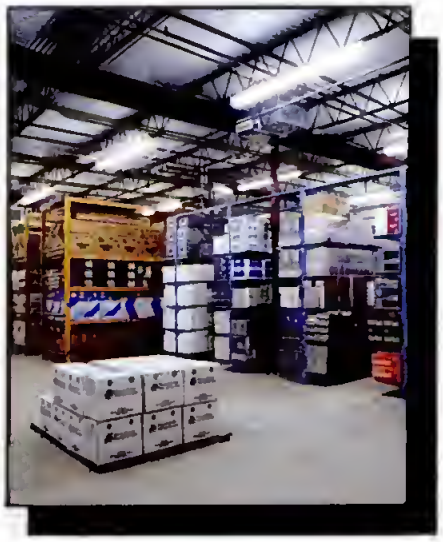
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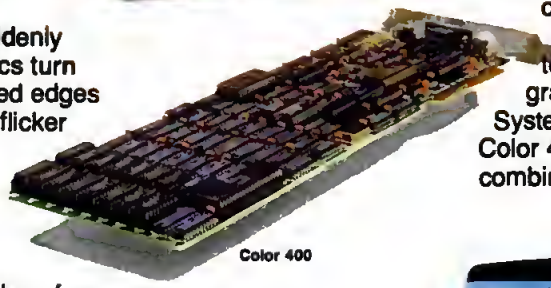
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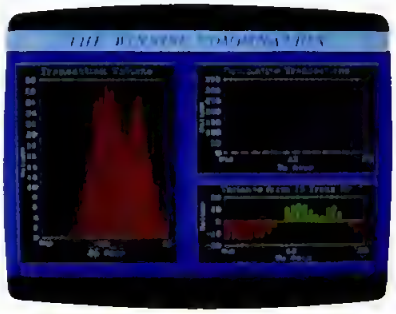


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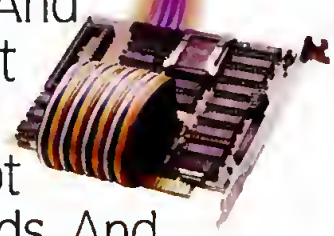
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■ STEWART ALSOP

DIFFERING VISIONS



What does it take to dominate the market for new technologies? The two visions of Digital Research's Gary Kildall and Microsoft's Bill Gates provide some insight.

If you were Gary Kildall, what would you do? Since 1981, Kildall, a former college professor, has kept running into Bill Gates, a college dropout—and he keeps getting bowled over.

Kildall is well known for the CP/M operating system. His company, Digital Research Inc. in Monterey, California, also developed the *GEM Desktop* operating environment.

Gates is noted primarily for the Microsoft BASIC programming language. Yet his company, Microsoft Corp. of Redmond, Washington, now markets the dominant operating system and the soon-to-be dominant operating environment (not to mention a healthy line of programming languages and productivity applications). Each time Microsoft developed and introduced a product in one of these areas, it has ended up taking the market away from Digital Research. Microsoft is now nearly a $200-million, publicly held company. Digital Research's revenues declined last year to $25 million or so.

Now, once again, Kildall must confront Gates's voracious appetite for dominating markets, this time in CD-ROMs. And nobody doubts what the outcome will be, not even Kildall himself, who's just hoping that he can get a small piece of the action this time around.

To Kildall, it could almost look as if Gates has been following him around to find out what the next hot area will be. That's not true, of course. But the story of Kildall's unfulfilled odyssey through the personal computer industry's first 10 years reveals a lot about the process of getting new technologies into the marketplace and what it takes to survive that process.

THE FIRST STANDARDS Gary Kildall is smarter than most of us could ever hope to be. For instance, back in 1974, when Intel developed the first microprocessor, he immediately saw the need for an operating system for the processor, even though the machines that would need such a system hadn't even been designed. When Intel said it wasn't interested, he wrote the system in a converted, backyard outhouse. That became CP/M, the first "standard" operating system.

But when IBM came looking for the primary operating system for its new computer in 1981, it gave favored status to Microsoft's operating system (which Microsoft had to buy from another company in Seattle), not Digital Research's. Why? There are many apocryphal stories about how IBM came to buy from Microsoft instead of Digital Research, mostly about how Kildall was flying an airplane when IBM's reps called on Digital Research. Essentially, the truth of the matter is that Kildall's lawyers balked at signing IBM's standard nondisclosure agreement before finding out what IBM wanted. (The agreement basically says that IBM won't be bound not to produce a competitive product if it doesn't like what it sees.) Gates's lawyers didn't balk at the agreement.



Illustration: Karen Stolper

Meanwhile, Digital Research also took a shot at competing with Microsoft in programming languages. It did quite well for a while with a product called C BASIC but has since appeared to drop out of the language market. On the other hand, Microsoft still gets about 30 percent of its revenues from languages.

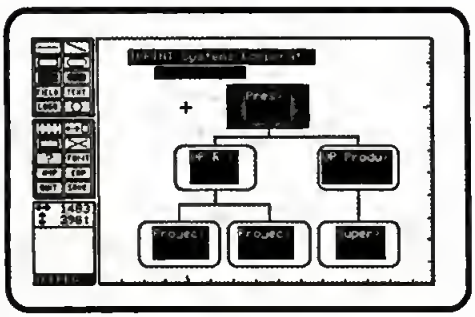
People now say that the only chance for saving Digital Research from the fate of many pioneering companies is its operating environment, *GEM* (which stands for Graphics Environment Manager). *GEM* wasn't the first operating environment; Xerox, Apple, and VisiCorp pioneered the field, and Microsoft announced *Microsoft Windows* before Digital Research even began developing *GEM*. But Digital Research delivered *GEM* early in 1985, about 10 months before Microsoft delivered *Windows*, and most people say that it did a better job of adapting the concepts of the Macintosh Finder interface to the existing PC architecture than anyone else. (Apple seems to agree, since it has legally forced Digital Research to change the "look and feel" of *GEM*.)

But Microsoft, even after an 18-month

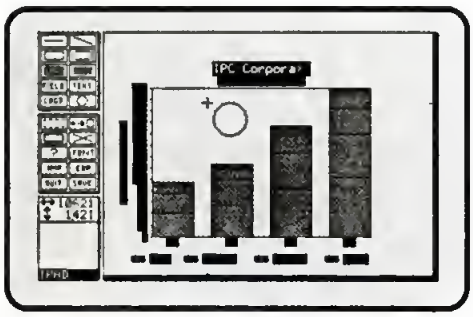
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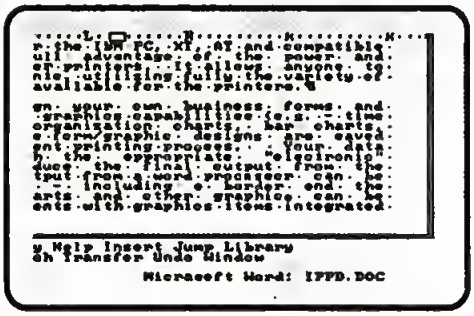
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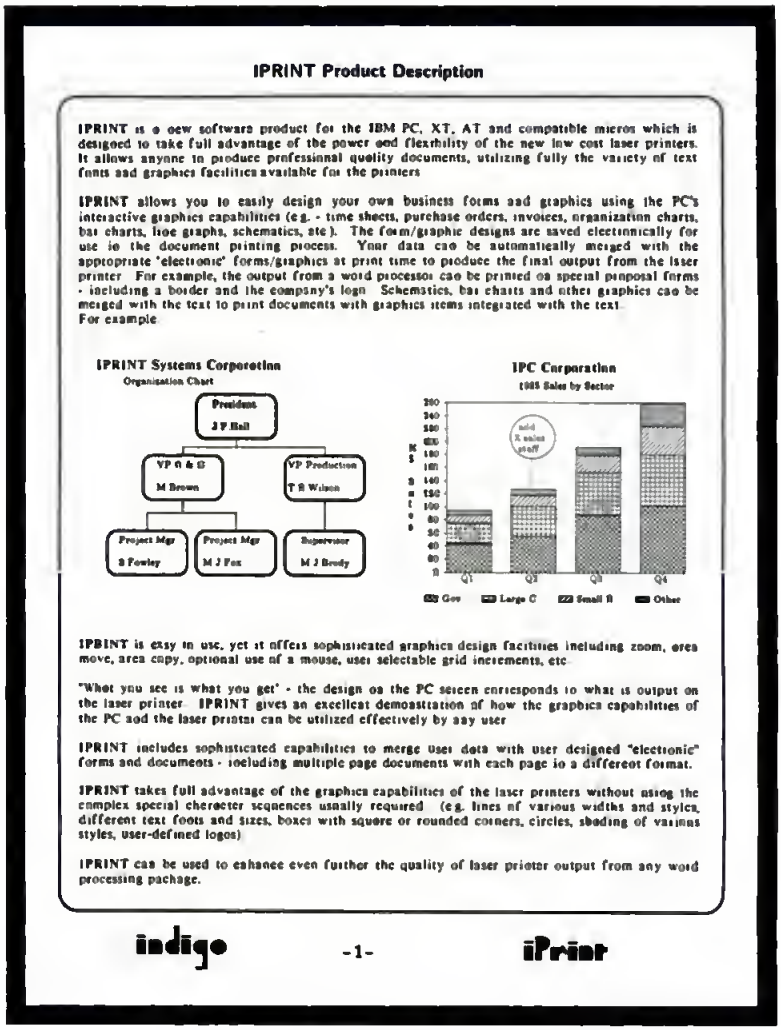


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J P Hall

VP Finance & Admin
M Brown

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Project Mgr
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Supervisor
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IPC Corporation
1985 Sales by Sector

Q1 Q2 Q3 Q4
Gov Large C Small B Other

IPRINT is easy to use, yet it offers sophisticated graphics design facilities including zoom, area move, area copy, optional use of a mouse, user selectable grid increments, etc.

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IPRINT includes sophisticated capabilities to merge user data with user designed "electronic" forms and documents - including multiple page documents with each page in a different format.

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■ **STEWART ALSOP**

delay in the introduction of *Windows*, appears yet again to have won out over Digital Research: more applications are being developed for *Windows*, more copies of it are being bought, and more manufacturers are rumored to be standardizing on it. Now, the only chance that anyone gives Digital Research is the potential of the Atari ST computers, on which *GEM* is the standard interface.

Kildall has since handed over most of his responsibilities at Digital Research to his investors and is focusing all of his efforts on starting a new company, called Knowledgeset Corp., which specializes in CD-ROMs. But Microsoft, Bill Gates in particular, is also interested in developing CD-ROMs. Kildall started working on optical storage products nearly 3 years ago. Gates started working on them a little more than a year ago. But already people perceive Microsoft as the company with the most to say about the future of CD-ROMs, even though it has no products to sell yet.

Now Gary Kildall faces not only the prospect of competing yet again with Bill Gates in developing applications for CD-ROMs but also of writing his programs in a Microsoft language to work on a Microsoft operating system within a Microsoft operating environment.

What makes Bill Gates come out on top time after time? Is his success just the result of getting IBM as a client and riding on its coattails? Not really.

SOMETHING EXTRA The difference can probably be boiled down to the difference between 20/20 vision and peripheral vision. Kildall is very smart. He can spot an important technology before anybody else. He's got 20/20 vision.

But Gates has something extra. He's got what I call peripheral vision. You could also call it a killer instinct. Gates can see not only the important technology but how to get that technology into the marketplace in a big way. And he's willing to do whatever is necessary to make that happen. He will twist people's arms to do things they might not want to do. He will make deals that don't seem to make sense—until years later. He will even give other companies the spotlight—at first. For example, at the first major conference on CD-ROMs, which Microsoft sponsored in March, Gates asked Kildall to co-keynote the conference. He did this not to be nice to Gary Kildall but to give everyone there a warm and fuzzy feeling about this new technology, to start things off right no matter what happens later.

It's killer instinct that gives Gates his edge—an edge that makes him not just a technological visionary, like Kildall, but also the leader of an industry.

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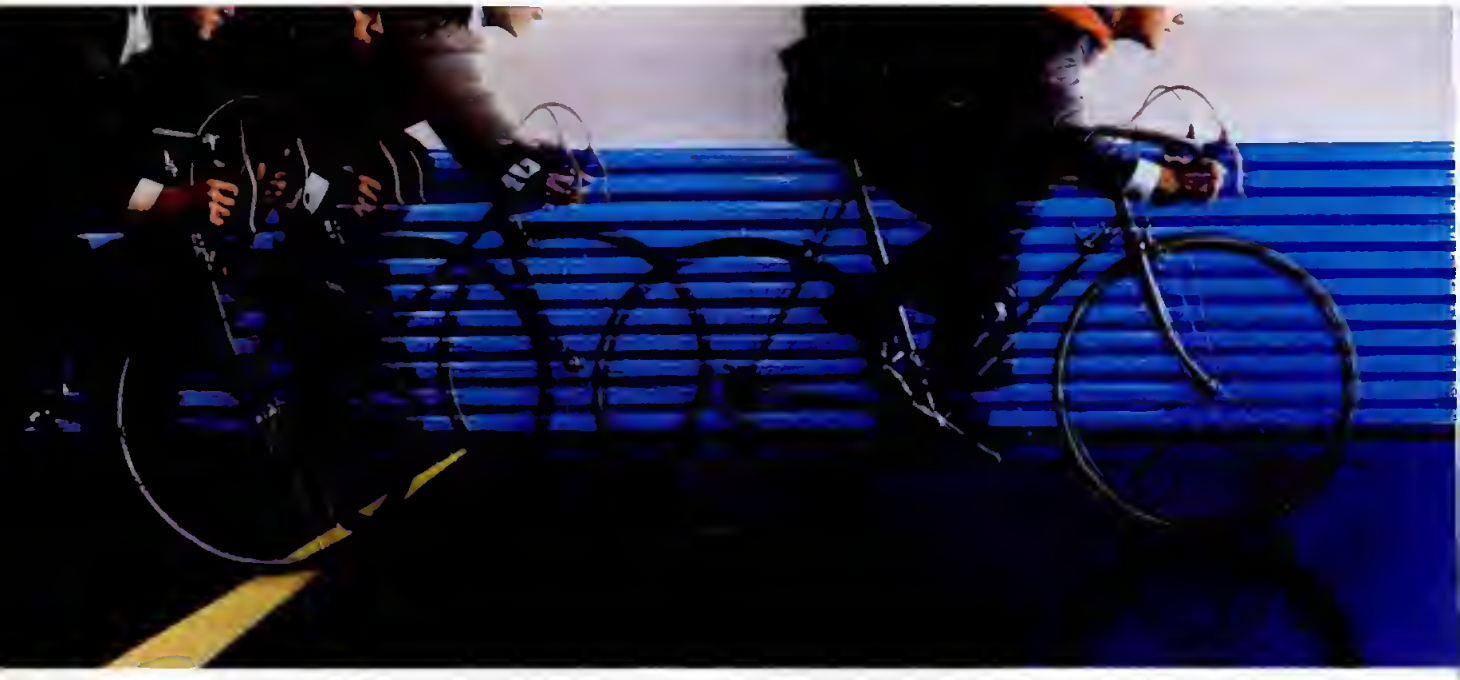
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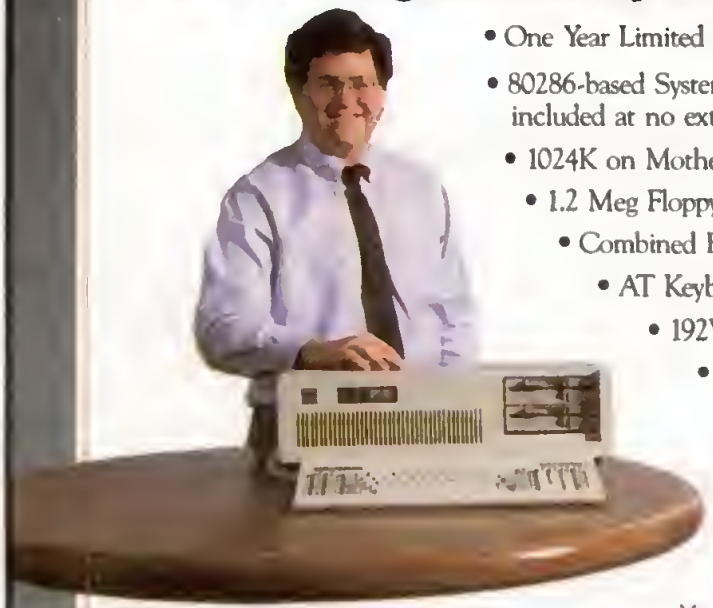
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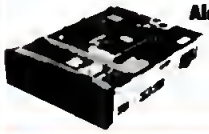
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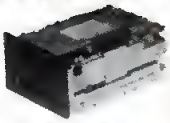
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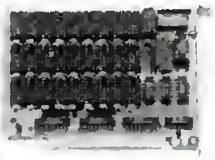
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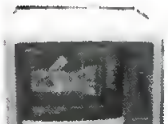
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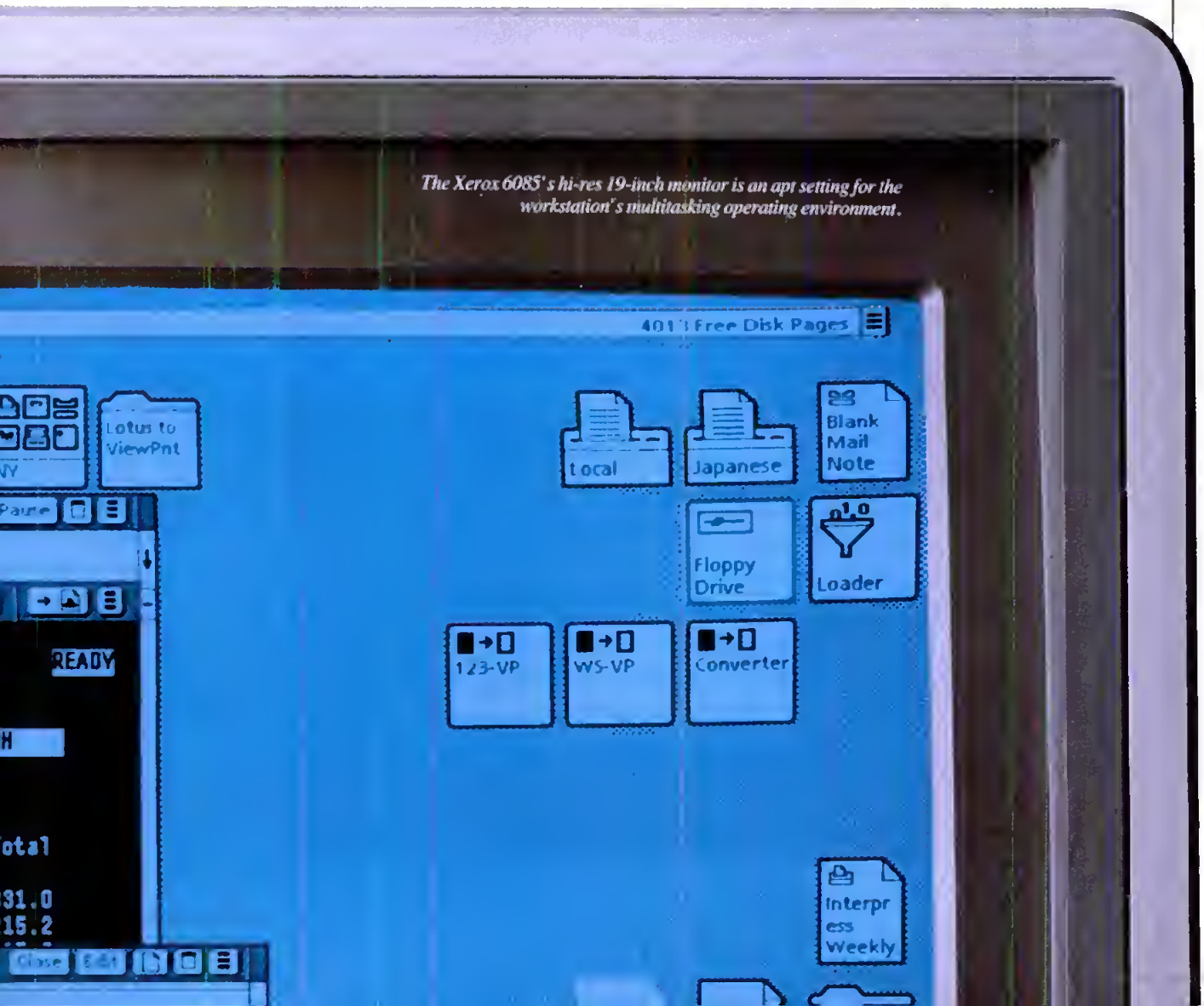
Editor's Note: Workstations that run DOS fit into a brand-new product category. It's so new that few of the machines are ready for hands-on testing in the PC Magazine Labs. We did get our hands on the new Xerox 6085, which Bill Machrone reviews in this issue (as more machines become available, *PC Magazine* will test and review them). And we asked several prominent hardware experts to report on various aspects of the subject we've called "DOS Meets the Workstation." As you'll find in the articles that follow (and as we expected), there is no single opinion about the place of DOS workstations in American business.

PC MAGAZINE

Once built to handle large graphics or engineering projects, workstations designed with a new, streamlined architecture are entering the business world.

You may be wondering what last January's introduction of the IBM RT PC means to you. Is your PC obsolete? Is PC-DOS on the way out? What *is* a workstation, anyway?

The term *workstation* is usually associated with the high-density graphics and interactive screen control needed for computer-aided design (CAD), computer-aided manufacturing (CAM), and computer-aided engineering (CAE). Normally, workstations are hefty 32-bit computers



The Xerox 6085's hi-res 19-inch monitor is an apt setting for the workstation's multitasking operating environment.



Along with Sun Microsystems, Apollo Computer has dominated the scientific workstation market. Apollo's response to the IBM RT PC is the Domain Series 3000 Personal Workstation (pictured above), a UNIX-based system with a 32-bit Motorola 68020 processor. The Domain Series 3000 accepts AT add-on boards and will run DOS programs in a window.

with a working memory of 4 or more megabytes and disk storage of at least 70 megabytes. The function of these systems is to display and control graphics images or graphics pictures, and digitized pictures take up a lot of memory. Workstations typically have large screens for bit-mapped graphics and one or more alternative input devices such as a joystick, mouse, or digitizer to control the screen. The operating system used for an engineering workstation is often UNIX.

Engineers, designers, editors, architects, and others who work with layouts, blueprints, or drawings can improve their personal productivity through the use of graphics workstations. These machines turn T-squares, triangles, erasers, and fancy drawing pencils into relics that belong in corporate museums along with carbon paper and stenographers pads.

American industries are turning to workstations not only to improve quality but mainly to increase flexibility. Redesigning complex parts is a necessary evil as market requirements, business practices, and sources of supply change. Thousands of small companies have found success by quickly responding to changes that bigger and less flexible companies have resisted. Giving people the tools to make changes is probably the best way to beat the inertia and resistance to change that are natural in large corporations.

Using a workstation, an engineer or designer can examine a drawing in fine detail or get a large overview. Parts of the drawing can be rotated, shrunk, expanded, or annotated. Changes can be made temporarily or permanently. Sophisticated programs even print out a bill of materials describing everything needed to manufacture the part as it is designed. The immediate effect of a change on performance and cost can be projected.

Business Week published estimates showing that there are about 40,000 workstations installed in the United States but that only about 10 percent of the need for this kind of system has been met. With market projections like those, it's no wonder IBM decided to enter this business.

THE LEADERS The companies that have prospered in the workstation marketplace are not the same as the ones that dominate the personal computer arena. Sun Microsystems and Apollo Computer have stolen the show from the traditional computer suppliers. Hewlett-Packard, with 15 percent of the workstation market, is the exception: it has retained the loyalty of the engineering crowd while making a name for itself in the personal computer field. These companies are currently coping with invasions from DEC (which entered the arena last May) and IBM (which took the plunge in January by announcing the RT PC). Heavy sniping is also coming from such large companies as Xerox and AT&T and other high-tech entrepreneurs like Convergent Technologies and Counterpoint.

Some of this competition takes the form of traditional workstations from new sources. But several of the new entries, such as the ones from IBM and Xerox, represent a new breed. Their ability to run MS-DOS, usually in a window, makes them accessible and interesting to a whole new class of users: businesspeople.

IBM's entry into the workstation market is not viewed very optimistically by market analysts. Its presence will cause the marketplace to pause, but if Big Blue has any technical problems with a new processor running a new operating system (a fine breeding ground for bugs), the market will sweep right by it.

Where the rubber meets the road—at the graphics display screen—IBM may already be spinning its wheels. Workstations are marketed to people who work with their eyes: picky engineers and designers who want things to look good on the screen. The best resolution the RT PC provides with the announced products is 1,024 by 768 pixels. Existing products

from the leading workstation companies are rated at 1,152 by 900 pixels. Of course, other factors, such as refresh rate, are also important in evaluating a display, but modern video techniques make 2,000- by 2,000-pixel displays with 60-Hz noninterlaced refresh practical. IBM isn't starting out by burning up the video display track. (The RT PC can be attached to an IBM 5080 Enhanced Graphics Processor using a 5081 display with 1,024 by 1,024 resolution, but that option adds about $20,000 to the system price.)

THE RT TAKES A RISC When you look at a workstation, you'll immediately notice some of the features that differentiate it from a personal computer. The screen is significantly larger (typically about 19 inches) and its resolution significantly higher. Internally, the two features that most clearly distinguish a workstation from a PC are a 32-bit microprocessor and a multitasking operating system. The RT's Reduced Instruction Set Computer (RISC) processor and UNIX system are good examples.

RISC ARCHITECTURE

Instructions that execute in one machine cycle and effective memory management contribute to the IBM RT PC's high throughput and dizzying speed.

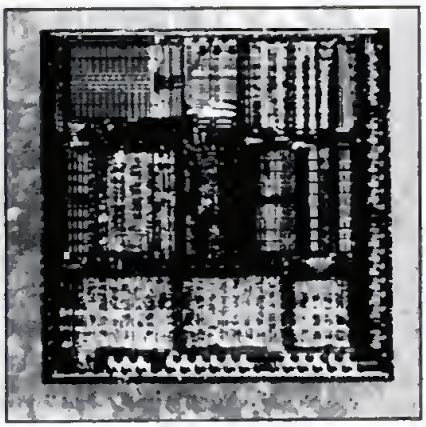
When the first Reduced Instruction Set Computer (RISC)—the IBM RT PC—was announced, the surprise wasn't the technology but the source. Hewlett-Packard had been talking about its pending move to reduced instruction set computing for some time; indeed, many expected Hewlett-Packard, with its Spectrum machines, to be the first major vendor on the market with RISC architecture.

It's appropriate, though, that the first generally available RISC machine comes from IBM: RISC began at IBM with the work of John Cocke. Along with others at IBM's Thomas J. Watson Research Center in Yorktown Heights, New York, Cocke cooked up a RISC-based mini—the 801—in the late seventies.

The 801 was strictly a laboratory prototype, never near commercial-product status, but its architecture foreshadowed what IBM has now squeezed into the desktop RT, embodying three essentials of RISC design:

First, the RT PC offers fewer but faster-executing command primitives (such as ADD, SUBTRACT, STORE, and LOAD) in the proprietary 32-bit microprocessor that lies at the heart of the RT (and almost certainly, at the heart of a whole generation of new RISC machines from IBM). With every wave of new chips over the past few years, more and more commands have been set in silicon. Some current microprocessors have twice the 118 "hard-wired" commands built into the RISC chip.

Second, 84 of the 118 instructions offered in the chip execute in one machine cycle—one tick of the RT PC's crystal clock—rather than the several cycles required by many of the extended instruction set commands of other microprocessors.



IBM's proprietary 32-bit microprocessor chip has 118 built-in commands and drives the RT PC at a speed of 22 MHz.

Third, the RT PC itself is driven at 22 MHz, a very high speed (compare that with the PC's standard 4.77 MHz or even a revved-up AT's 8 MHz).

The result of these technological marvels is very high effective throughput. The effective speed of big-iron minicomputers and mainframes is typically expressed in terms of MIPS, or millions of instructions executed per second. IBM rates the RT PC at around 2 MIPS, which puts it very much in the computer big leagues.

Beyond the raw computing speed of the RT's RISC design, efficient shuffling of a phenomenal trillion-bytes-plus of virtual memory by a companion memory-management chip will someday contribute to the fast operation of extremely "smart"—which is to say complex—programs. Virtual memory is a nice trick that, through fast and well-managed swapping of chunks of program code and data back and forth between disk and RAM, makes a machine with "only" a megabyte or 2 of RAM appear to its user as if it had hundreds of times as much memory.

But there's less here than meets the eye, at least for now. A trillion bytes of virtual memory is a lot like those mammoth spreadsheet programs that offer two-million-cell-plus worksheets: it sounds terrific until you actually try to use them. With time, programs will be written by ambitious programmers to use that much memory (and large enough hard disks installed on RT PC–like machines to give all those virtual bytes a home). But at least for now, the virtual memory aspect of the RT PC will remain a tantalizing opportunity, not a widely used feature.—**Jim Seymour**

Jim Seymour is a contributing editor of PC Magazine.

MARKETING THE IBM RT PC

The RT arrived on the market with the right stuff—and some weak points, too. Can it tough it out against the strong competition already out there?

IBM's new RT PC is a curious beast, with tough-to-figure market prospects. For techies, it's a delight. For those who've been waiting for an industrial-strength UNIX-based PC from IBM for engineering, architectural, and scientific work, it's an enigma. And to IBM's competitors, it looks like an easy target in terms of price and value.

Many of the engineers, scientists, and architects who have been awaiting such a machine from IBM (the curiously ambiguous term for such computers is "engineering/scientific workstation") see in the RT PC products included in IBM's announcement a puzzle, not a complete answer to their needs.

These applications are invariably graphics-intensive, for example, so the RT PC's speed is particularly welcome. But no high-resolution color display is immediately available for the RT from IBM. Initially, IBM will deliver a nice but too small $610 12-inch monochrome display, with ho-hum 720- by 520-pixel resolution. Coming in September will be a reasonably priced ($1,550) 14-inch 720- by 512-pixel 16-color display, and a $1,150 15-inch 1,024- by 768-pixel monochrome display.

Those monitors are too small for many engineering and scientific applications, though the 15-inch 1,024 by 768 monochrome monitor may be interesting. Anyone who's worked with a large, high-resolution monochrome display—as on the Sun workstation or Texas Instruments' lovely Explorer artificial intelligence workstation—understands why big screens, high resolution, and a long palette of simultaneously available colors are so important.

This isn't just a case of "bigger is better," nor of self-indulgent, grant-supported techno-wizards grasping for nifty toys. Biotechnology researchers, for example, love their Evans and Sutherland workstations, which allow them to experimentally disassemble and reassemble molecular jigsaw puzzles. Smaller or lower-resolution displays would genuinely impede their work. Ditto for architects taking clients on a three-dimensional "walk-through" of a new building—a building that exists only in the mind of the computer—and for structural engineers using finite-element analysis to study stresses in I-beams.

■ Apollo had brave words on the day the RT was introduced: "Frankly, we expected more."

IBM needs to do better with reasonably priced displays—and soon. To be sure, enhancements to IBM's gorgeous 5080-series graphics processors were announced along with the RT, and the RT PC works well with these displays. But at $13,000 to $18,000 for the 5080s alone, the idea of an affordable big-screen, high-resolution, fast-processing workstation built around the $18,000 RT PC disappears. This fact has not gone undetected by the competition.

Apollo had brave words on the day the RT PC was introduced. "Frankly, we expected more," said an Apollo vice president. The company quickly followed up with the announcement of its putative "RT PC killer," the Domain Series 3000 Personal Workstation. Though it looks a bit like a PC AT that got mugged by a venetian-blind installer, the DS-3000 PW has better specs than the RT. The awkwardly named box has, Apollo says, twice the MIPS (millions of instructions executed per second), four times the floating-point processing speed, and twice the pixels in its (larger) display options than the IBM entry. Apollo's aging workstation line has brought the company woe of late, but the company's new boss, Tom Vanderslice, seems to be applying just the kind of discipline needed.

Digital Equipment Corp. has, of course, the MicroVAX II, which along with the PC AT has helped to redefine the term *micro computer*. MicroVAXstation products are being positioned squarely against the RT PC.

Finally, the third leg of the engineering/scientific workstation triad, Sun Microsystems, seems relaxed and unworried in the face of the IBM RT PC introduction. Upstart Sun has been scaring the hell out of its competitors for 3 years, pressing for adoption of an industry-standard operating system (UNIX is the standard in the engineering/scientific world), large, high-resolution displays for graphical interfaces, and unexpectedly high price/performance ratios.

If those sound like familiar strategies, you've been reading the book Don Estridge wrote at IBM's Entry Systems Division from 1981 through 1984. Maybe IBM should study its own recent successes a little more closely. A brand-new $13,000-range Sun workstation ought to scare the competition—Big Blue included—even more.

The RT PC is unquestionably a marvel—and a milestone, albeit a modest one, in the history of the personal computer industry. If it's overpriced, has inelegant graphics, and inspires more hubris than chills in the competition, worry not: the pixy dust falling from those letters on the nameplate will still secure its place in the market. **—Jim Seymour**

The RT PC's microprocessor, based on the 32-bit IBM 801 minicomputer design, is nothing like the Intel chips we're used to. (By adding coprocessor hardware, IBM has given the RT the ability to run AT software, but that is only a spin-off of the RT's real talents.)

Processor instructions decide if a processor cycle is going to result in addition, examination, comparison, or some other function. The IBM 801 reduced instruction set processor has a vocabulary of 118 instructions. Eighty-four of the instructions are simple enough to execute in a single machine cycle. The Intel 8088 has 111 instructions, but almost all of them take several machine cycles to execute. The newer members of the Intel family of microprocessors have vocabularies of several hundred instructions, but the instructions are increasingly complex.

The difference between these processors is one of design philosophy: one chip makes a higher number of revolutions, and the other operates at a lower speed with more power in each stroke. Critics of the high-speed philosophy point out that because the 801's instructions are simpler, it takes many more instructions to do practical work. They claim that the limited number of simple instructions force machine language programs to be more detailed (therefore more error-prone) and that the processor just has to execute more instructions to get a particular job done. Advocates of reduced instruction sets claim that machine language programs will require few if any modifications as the processors change and that the processors can be optimized for the jobs they have to perform (for more on the RISC microprocessor, see sidebar "RISC Architecture").

SMOOTH SHIFTING The RT PC runs UNIX, an operating system with a well-deserved reputation for grinding gears. Its commands are obtuse, and their structure can easily lead to frustration for you or disaster for your data. However, IBM claims to have put an automatic shifter called the Advanced Interactive Executive (AIX) onto the UNIX system and married it to the RISC processor.

UNIX enjoys increasing popularity for reasons both historical and practical. A great many computer scientists in the United States learned their art on UNIX machines. Digital Equipment Corp. sold many DEC and VAX computers to colleges and universities, but AT&T literally gave away its UNIX operating system. Many undergraduates saw IBM computers only in books and in registrars' offices; UNIX on a DEC PDP-11 is what they learned. AT&T now spends tens of millions of dollars annually to promote UNIX, and even DEC has lifted its corporate head out of the sand long enough to release a UNIX-like operating system for its own hardware.

■ The multiuser appeal of UNIX has not gone unnoticed in the Microsoft camp, and the popularity of MS-DOS is not lost on IBM or AT&T.

UNIX easily handles some tasks PC-DOS can't perform well. Since it was designed to be a multiuser system, UNIX promotes sharing of files and resources such as printers among users. AIX on the RT PC can support up to eight simultaneous users. Indeed, UNIX is so good at sharing resources that one recognized problem is how to limit file access for security purposes. There are good multiuser database programs available for UNIX machines, and the energy of AT&T and other strong members of the UNIX camp has encouraged programmers to port other personal productivity programs such as spreadsheets to UNIX systems.

The multiuser appeal of UNIX has not gone unnoticed in the Microsoft camp, and the wide popularity of MS-DOS is not lost on IBM or AT&T. These companies and others are working to build strong bridges between MS-DOS and UNIX, and many experts in this area predict that complete data file portability will be a reality after a few more DOS releases. Perhaps even before that time, extensions of the operating system such as *Microsoft Windows* and IBM's *TopView* may make the differences invisible.

IBM has tried to help PC users feel at home behind the keyboard of an RT PC by designing one of the four interchangeable AIX "shells," or command entry systems, to operate like PC-DOS. Two of the other shells answer to the more familiar UNIX commands, and the fourth user interface includes a prompted fill-in-the-blanks menu for persons inexperienced with computers.

EVOLUTION OR DEAD END? The RT PC is clearly a machine designed to fill several niche markets, but it is not the first member of a family aimed at replacing the standard PC. The RT PC is a fast and powerful multiuser computer than can step down to do mundane PC chores like word processing or spreadsheet analysis. The standard PC will continue to evolve through the Intel 80286 and 80386 family of processors. In about 2 years, PCs with these processors will be able to step up to the more technical and complex jobs the RT is designed to do. Meanwhile, the RT may continue to grow to challenge IBM's existing multiuser systems such as the venerable Series/1. The future of the RT will depend on the success of the engineering philosophy behind its processor.

The RT PC and other new-breed workstations with DOS capabilities should be very attractive to corporate buyers because of their capabilities for all-around service. Engineers who want only one machine on their desks can be satisfied with an RT PC for graphics, personal computing functions, and remote-terminal operation. The large number of expansion slots in the RT PC and the ability to use PC AT function cards will enable corporate users to customize the system for many different applications.

A workstation is tied as closely to the application for which a system is used and the profession of the person behind the console as it is to the configuration of the hardware. Whether the new generation of workstations will change that verity, only time will tell.

Frank J. Derfler, Jr., is a contributing editor of PC Magazine.



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DOS MEETS THE WORKSTATION

The familiar face of DOS and the speed and power of the scientific workstation come together in the Xerox 6085, the businessperson's workstation.

There's a PC AT on the conference table in my office. It's adorned with a Wyse WY-700 display adapter, replete with 14-inch screen and 1,280 by 800 resolution. It's running *Microsoft Windows*. People see it, and a look of naked desire appears on their faces, the kind Bruce Springsteen writes songs about. When they get a look at another machine, one with a Moniterm monitor with a 19-inch screen, same resolution, that desire will turn to lust.

Businesspeople are about to discover what scientists and engineers have known all along—workstations are more productive than personal computers. First off, let's define what a workstation is and how it differs from a PC or a terminal.

A workstation is distinguished by its larger-than-normal, high-resolution graphics screen. Its software allows it to do more than one thing at a time, or at least put multiple tasks up on the screen. It typically has communications capabilities that allow it to do local processing and work through a host system at the same time. It has local disk storage but may also network into a larger system.

Now the workstation and MS-DOS have met, and DOS must rise to the challenge. The most popular user interface in the world lives under many constraints, not the least of which is the ungenerous 25-line by 80-character display. Graphics environments such as *Microsoft Windows* can put more lines on the screen, and display systems such as the EGA can handle up to 43 lines of text, but the 13-inch screen remains a limitation—and an artificial one at that.

THE JAWS MARKET The scientific and engineering workstation market is already crowded and competitive. The scions of Silicon Valley have already coined an acronym for the glut of new products: JAWS (just another workstation). While familiarity can certainly breed contempt, it's amazing that the high-tech crowd is already jaded while the business market hasn't even heard of workstations.

Price, of course, has been a barrier. It's one thing to equip engineers designing integrated circuits with $25,000 workstations. It's the only way they can do their jobs. Analysts in the long-range planning



The Xerox 6085's flashiest feature is its stunning 19-inch black and white monitor, with 1,280 by 800 resolution. The monitor's size—along with the operating system's multitasking capabilities—allows the user to open multiple applications windows simultaneously. The 6085's large system unit, at left, is meant to sit on the floor.

department are not likely to justify such expenditures on their productivity tools. But when the price dips down into the $10,000 range, the picture begins to change. Suddenly the integration, the resolution, the multitasking, and the communications capabilities cost what they would for a PC, if they're available at all.

Also, most of the workstation vendors are techies. They don't understand the business market. Apart from a few shining exceptions, they don't know exactly how businesspeople use PCs. Worse, they can be scornful of the "low-powered" PC. Scorning a six-million-machine market can be injurious to your financial health, but there is a ray of hope on the horizon: the more farsighted workstation vendors have built bridges to DOS in their latest machines.

Others have started with a clean sheet of paper (or a cleared screen). Just about everything good you've ever seen on a graphics screen is traceable to Xerox's Palo Alto Research Center (PARC). Machines with names like Alto, Tioga, and Star occupy warm places in the hearts of some of this industry's most talented designers. At times, it seems that everyone but Xerox has benefited from all this technology, but that's because Xerox has kept a very low profile in all but its most secure markets.

THE BUSINESSPERSON'S WORKSTATION Now Xerox has crafted a business professional's workstation for the information processing and office automation markets: the Xerox 6085 Professional Computer System. "6085" doesn't have quite the same ring as "Star," but this machine is a knockout in every other respect. It sports a 19-inch monitor capable of displaying two full pages of text side by side. It runs DOS in a window, on an 80186-based compatibility card. Fully loaded, it packs up to 3.7 megabytes of RAM and 80 megabytes of disk storage. It has two serial ports, an Ethernet adapter, and a mouse.

The 6085's focal point is its magnificent screen. Though monochrome, it's breathtaking. At 80 dots per inch (1,280 by 800), even the smallest typefaces are crisp and clear. The icons are easy to recognize, and the resolution more than makes up for the lack of color. Indeed, the inherently higher brightness and the shadow mask of a color tube might be hard to take at close range.

The configuration of the 6085 is a little unusual: it's a dark brown box, about a foot square and 2 feet high, that is meant to stand on the floor and run continuously. The power-on self-test is slow and exhaustive—more than 10 minutes—so you wouldn't want to shut the machine off more often than is necessary. The floppy disk normally sits on top of the unit, but the cable is long enough so that you can place it on top of the desk if that's more convenient.

The 6085 has its own operating environment, called ViewPoint. It is a multitasking, proprietary operating system designed for Xerox's Mesa 16-bit processor. ViewPoint has available word processing,

spreadsheet, communications, data-driven graphics, a drawing program, and a list manager. The user interface is a dream come true—MS-DOS designers will be stealing from it for years to come.

Phoenix Software Associates designed the DOS compatibility card and the BIOS to drive it. On the big screen, DOS opens a window that contains a standard 80-character by 25-line screen. The box around it contains various controls, such as the number and kinds of disks available to DOS and screen attributes. You can position the DOS window anywhere on the screen and change its size, but DOS applications, by and large, are unable to take advantage of a larger window size.

The 6085 runs all mainstream DOS programs. The most important are programs such as *1-2-3* and *dBASE III*—partly because they are among the most common applications, but also because they buttress potential weaknesses in the 6085's software lineup. It would be foolish in most instances to run a DOS word processing program on the 6085 because the resident ViewPoint word processor is vastly superior to most anything DOS has to offer. The spreadsheet, on the other hand, falls considerably short of *1-2-3* in power. Its chief advantages are the large size of the visible worksheet and seamless integration with the other applications, including the graphing program.

1-2-3 users won't be cut off from the 6085's presentation power, however. You can import data directly from a *1-2-3* worksheet and use the ViewPoint graphics program to produce some beautiful charts. Or you can capture a bit-mapped image of a *1-2-3* graphics screen and use the drawing program to enhance the bare-bones *1-2-3* graph. In either case, you can merge the resulting graph into text documents.

It's particularly advantageous to use ViewPoint's graphics program if you're merging the images into a document that's going to be revised. ViewPoint's integration is so good that if you change some figures in a chart's input spreadsheet and reprint the document that contains an image of the resulting graph, the graph will be updated in the new output. This feature is analogous to mail-merging images: as you print, the most recent elements that make up a document are assembled into a finished, updated document. ViewPoint handles the hard stuff; the feature is almost effortless to use.

Workstations: Summary of Features

	Approx. configured price	Resolution	Screen size (inches)	Processor	Operating System	Multitasking	Networking	Integration
Wyse WY-700	$ 8,000[1]	1,280 × 800	14	16-bit	PC-DOS *Windows*	Limited[2]	Any PC-compatible	Low[3]
IBM RT PC	$20,000	1,024 × 768	15	32-bit	UNIX/AIX, MS-DOS	Limited[4]	PC Network[5]	Medium[6]
Xerox 6085	$10,000	1,280 × 800	19	16-bit	ViewPoint, MS-DOS	Full	Ethernet	High

1. Includes network adapter and fully loaded AT. 2. *Windows* multitasks when processes write to the screen simultaneously. 3. Integration is highly dependent on applications programs. 4. DOS and UNIX cannot share the same screen. 5. No software available yet. 6. Some of the RT's applications are highly integrated, but none with PC-DOS.

■ DOS programs are only the beginning of your conversation with the 6085; the real power is in ViewPoint.

If you think I'm spending more time talking about how the 6085 runs non-DOS applications than DOS, you're right. DOS programs are only the beginning of your conversation with the 6085; the real power is in ViewPoint. In another sense, the DOS compatibility board is a sharp rejoinder to the smug guy at the demo, standing in the back of the room with his arms folded, asking, "Yeah, but can it run *1-2-3*?" You bet it can. About twice as fast as an XT, a third slower than an AT.

A COMMUNICATIONS MARVEL The 6085 can do things that your PC never dreamed of. One afternoon, I opened and logged into four remote mainframe sessions, did some database work on a VAX connected via Ethernet, dialed MCI Mail through a remote modem 50 miles away, sent some forms to the laser printer, and mailed a virtual floppy disk to a PC on the other side of the floor via Ethernet. Simultaneously. Each session had its own window, and I could see what was going on in each. Meanwhile, the 6085 logged all the transactions, by screenful or entire session, as I wished. It received incoming mail, dated it, and filed it, creating an icon on the screen. The 6085 is the communications equivalent of dying and going to heaven.

Throughout ViewPoint, you'll come across the concept of "properties." Just about everything you can point at with the mouse has properties. They can be as simple as whether an image is displayed white on black or black on white. They can change the thickness and style of lines or make hidden lines appear and disappear. They change the functionality of programs and peripherals. For instance, the properties window for a virtual disk controls the number of sides, the number of sectors per track, the formatting, and even whether it is write protected. Properties in the word processing program control the number of columns, the size and style of type, justifi-

PC MAGAZINE FACT FILE

Xerox 6085 Professional Computer System
Xerox Corp.
101 Continental Blvd.
El Segundo, CA 90245
(213) 536-9127
List Price: from $4,995
CIRCLE 864 ON READER SERVICE CARD

ERROR CORRECTION INSTEAD OF JUST DETECTION

The IBM RT PC's subsystem memory is truly a step above other PCs—it uses a bit error-correction scheme.

The memory subsystem of the IBM RT PC marks a significant break with the designs of previous IBM personal computers. The workstation uses bit error correction, an advance that brings it a step closer to the ranks of mainframe machines. All previous IBM personal computers have used a much simpler technology called error detection.

The huge memory capacity of the RT PC probably underlies IBM's decision to add error correction to it. In any computer, as memory capacity increases, its vulnerability to bit errors also increases. The difference between error detection and error correction becomes evident when a single bit in the RAM of the host computer goes bad.

Even the simple error detection used in IBM PCs will discover such a memory error almost immediately. When it does, the computer will instantly lock up with a Parity Check error message displayed on the screen. The philosophy underlying this action is that it is better to lose all your work than to risk even the smallest error in it.

Error correction not only discovers a bit error in memory but can also precisely identify which bit went bad. The error is then automatically repaired. Nothing is harmed, and the computer continues to function as if nothing happened. Nearly all mainframe computers use some form of error correction.

PC error detection works simply. The digits of each memory byte are summed, resulting in either a digital 1 or 0. The parity check bit is switched on or off to maintain a consistent total. If any one bit changes, the final total will be wrong; the computer is primed to sense the error, and when it does, it takes immediate—and irreversible—action.

The RT PC uses a much more elaborate system called a Hamming code, named after Richard Hamming, who discovered the principle at Bell Telephone Laboratories in 1948. In the Hamming code, the bits in a memory word are rearranged into many overlapping groups that are then individually parity-checked. These groups in turn are further grouped together and parity-checked. Each single bit error gives a distinct signature of bad parity checks and can thus be identified and corrected.

If two bits simultaneously go bad in a single memory word, the Hamming code produces an ambiguous parity check signature indicating simply that the error has occurred. Because of the ambiguity, however, such a double-error cannot be corrected. In the specific case of the RT PC, the double-error will shut down the computer. In contrast, double-errors in previous PCs sneak by undetected, polluting the data stream.

■ Error correction not only discovers a bit error in memory but can also precisely identify which bit went bad. The error is then repaired.

EXTRA BITS AND BUSES The Hamming code requires that each memory word in the RT have several extra memory bits. All other full-size IBM personal computers use nine bits for each byte of memory and require nine RAM chips for each bank of RAM; they use the extra bit for parity checking to find errors. The RT uses double that number of spare bits. Each 32-bit word of RT memory has a full byte of memory devoted to an error correction code (ECC), so a single word of RT memory requires a full 40 bits of storage.

MAXIMUM PHYSICAL MEMORY Unlike in previous PCs, which placed their memory support circuitry (including error detection) on expansion memory boards, IBM has simplified the RT PC expansion memory boards by moving the support circuitry (including that required by error correction) off. Memory management is provided on the main processor card, which connects to the two allowed expansion memory cards through a pair of dedicated slots, each with 40 data lines and 24 address lines in the bus.

The 24 address lines permit a maximum physical memory of 16 megabytes in the RT. Current models use industry-standard 256K-bit NMOS (n-channel metal oxide semiconductor) dynamic random-access memory (DRAM) integrated circuits, for a total system memory (with both memory expansion cards in place) of 2 megabytes. When 1-megabit RAM chips become widely used, undoubtedly these memory boards will be modified to use them, boosting the RT to its design limit of 16 megabytes.

The error correction capabilities of the RT do not extend to its optional AT-compatible 80286-base coprocessor subsystem. However, one aftermarket product, Orchid Technology's Eccell multifunction board, can add ECC-protected memory to the AT-compatible section of the RT. The same board will add ECC-protected memory to an ordinary AT, although the board does not protect the AT's native RAM. (See "More Options for Enlarging the Dimensions of Memory" in this issue for a review of the Eccell board.)—**Winn L. Rosch**

Winn L. Rosch is a contributing editor of PC Magazine.

cation, margins, and every other format option you could imagine.

THE FINE ART OF NETWORKING The 6085's networking is raised to a fine art, as you would expect from the company that fostered Ethernet. All files are neatly organized into file drawers and folders. Data translation and format conversion are built in and utterly transparent. You can talk to IBM mainframes, minicomputers, PCs, and other Xerox workstations without missing a beat. You can "mail" a virtual floppy disk to another station. It arrives, and a floppy-shaped icon appears on the screen. You click on it, and a directory appears. You point it into your DOS window, and you can read and write files on it. Then you mail it back, not as files, but as a "floppy." When it arrives at the other end, it contains the updated files. Of course, you can bridge to other LANs as well and repeat the whole performance there.

Xerox hasn't neglected the printed word, either. The 4045 laser printer/convenience copier and Xerox's other laser printers print at 300 dots per inch, good enough for letter-quality correspondence, lightweight publishing, and good illustrations. Xerox throws in a Diablo dot matrix printer with every 6085, for drafts and proofs. Xerox will soon offer the 6085 together with the 4045 in a single-user system called "The Documentor," a powerful documentation system capable of quality output in many languages, scientific notation, and integrated graphics.

AN INFORMATION-PROCESSING WORKSTATION Xerox has conceived the 6085 as an information-processing workstation rather than a data processing or design workstation. It is based on the increasingly popular sensibility that everyone is in the desktop publishing business. The quality of presentation has always counted in business: when quill pens were the state of the art, good penmanship was mandatory. Typewriters were snapped up by the millions as they went from mechanical to electric to electronic. Word processors were the next logical step, and they are replacing typewriters by the millions. From this point of view, the 6085 is the next step in a logical progression of ever-more-capable means of presenting text and graphics.

That's not to say that the 6085 will replace PC ATs. It won't in all but the most network-intensive and sophisticated applications. That's right—the PC is several notches below the 6085 in conception, integration, operating environment, and flexibility. I said before that DOS architects will be stealing from the 6085 for years to come. They will, and they'll still fall short of the mark. Until DOS becomes a real multitasking operating system, the PC won't have enough horsepower to do the 6085's tricks.

THE RT'S ROLE That's not to say there aren't some other valiant efforts out there. The IBM RT PC comes close to being a business workstation, even though it is carefully positioned as a scientific and engineering product. The RT runs DOS, albeit not in a window, on its high-resolution graphics monitors. The RT controls multiple monitors from one keyboard, so you can switch between a DOS application on an Enhanced Graphics Display and UNIX applications on the big screen.

Still, the machine was introduced with a wealth of good business software, such as Applix A, *Samna+*, and the *Solomon* accounting series. Ostensibly, small engineering companies will avail themselves of the RT's design prowess and have time left over to do their billing and word processing. This is a good idea, especially if the nonengineering applications are character-based rather than graphic. Then users can move the work off the main moni-

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IBM RT PC
IBM
For more information, contact your local branch office.
List Price: 6151 Model 10, $11,700; 6150 Model 20, $14,945; 6150 Model 25, $17,940; 6150 Model a25, $19,510.
CIRCLE **063** ON READER SERVICE CARD



The RT PC is IBM's entry in the workstation arena. Shown here is one of the RT's color/graphics monitors, a high-resolution 15-inch display on which it can run DOS. The RT can also connect to a larger monitor for UNIX applications, and its keyboard can switch between the two displays. The AT-like system unit can sit on a desktop or on the floor.

FUTURE PCs: BOLD VISIONS

IBM has marketing leverage with the 80286, but is the 80386 market up for grabs?



Neil Colvin, president of Phoenix Software.

Neil Colvin is a visionary. He's also opinionated and irascible, but it comes with the territory. More often than not these days, he's also right. Colvin is the president of Phoenix Software Associates, the purveyor of software and hardware to make compatibles truly compatible. Phoenix also produces some of the finest professional program-development products on the market and has a growing business in applications software.

Phoenix Software worked with the developers at Xerox on the board and software that give the Xerox 6085 Professional Computer System its DOS compatibility. Phoenix is also behind the compatibility cards on most of the other workstation products that are jumping on the DOS bandwagon.

Despite this, Colvin doesn't think much of the current crop of workstations as the way of the future for business users. "The 80386 will blow the market apart," he asserts. "It's got more power than any of the current machines—it makes the 68000-based machines look sick."

He also observes that the 80386 has built-in DOS compatibility and more than enough power to run DOS or multiple copies of DOS as a subtask under a parent operating system. The architecture of the 80386 makes running DOS as a subtask under UNIX trivial. Furthermore, it's all done in software, as opposed to hardware-intensive solutions such as compatibility cards and the memory managers built into the IBM RT PC and the AT&T 6300 Plus.

What is that operating system to be? "Not UNIX," says Colvin. "It's just not a business operating system. There's no OS-level automatic backup facility and nothing like checkpoint restarts or other features that business users need." He also believes that Microsoft is wasting time on new versions of DOS for the 80286. He feels that this chip will quickly be eclipsed by the 80386: "The future workstation and the future PC will be synonymous. The cost difference between putting an 80286 or an 80386 in there is negligible."

"The new market comes down to questions of leverage," says Colvin. "IBM continues to have marketing leverage, but the 80386 gives everybody the same technical leverage."

Colvin's views are congruent with those of accelerator card manufacturers who are currently designing 80386 cards for today's crop of PC ATs. At first, they'll just be even-faster ATs, but ultimately, they'll run new operating systems and new software that we can only dream about today.

But at this juncture the future is fraught with problems. Numerous computer manufacturers are in danger of balkanizing the market by designing their 80386 machines without waiting for an IBM design to copy. They're banking on the 80386's built-in DOS compatibility and the ministrations of vendors like Phoenix to provide them an instant market and future compatibility with unreleased IBM products.

From early reports, however, there is no standardization in the design of a 32-bit memory bus that is upwardly compatible with existing PC and AT cards. This raises the specter of chaos in the aftermarket, with resultant IBM dominance. Another scenario would be of compatible manufacturers and board manufacturers banding together and developing a standard—before IBM brings its 80386 machine to market. Could they do it? Might they do it? We'll have to wait and see.

—Bill Machrone

tor and onto an inexpensive terminal connected to the RT by a serial port. Ah, the blessings of multiuser systems!

The RT has some serious limitations when running DOS. First, it doesn't run on the big color or monochrome displays. Second, it doesn't run on the multiuser terminals, and third, it isn't well integrated with the UNIX applications. If you want to run a *1-2-3* model or a *dBASE* application, you must switch from whatever you're doing on the main screen and flip to the DOS screen. The other users can keep on running UNIX on the remote terminals.

Can the RT be as capable a business machine as the 6085? Sure—all it takes is software. Will someone write such software? Probably not. For the reason, see the sidebar, "Future PCs: Bold Visions."

In the meantime, the JAWS crowd is flocking to DOS compatibility. Their DOS option cards, however, are expensive, typically costing over $1,000. Considering that you can buy a PC for less these days, there's little of interest to the business user who's looking for workstation capabilities to boost his productivity. Apollo, Sun, Hewlett-Packard, and Convergent all have announced or are about to announce DOS compatibility boards. The smaller workstation manufacturers will follow suit in order to stay in the race, but the business and professional user shouldn't really expect too much from them.

ROLL YOUR OWN How about the alternatives? Given the incredible variety of hardware and software available for the PC, can you build a workstation worthy of the name? Yes and no.

The Wyse WY-700 monitor that I mentioned at the outset sports 1,280 by 800 resolution. *Microsoft Windows* and *AutoCAD* look stunning on it. *Windows Write* lets you put up an entire page of text or two pages side by side. The only problem is that the tube is still too small; when you run *Write*, the characters are too small for comfortable working distances. Never mind that they are jewel-like and perfect. The same card and the same resolution on a 17- or 19-inch monitor would put it in the same class as the Xerox 6085.

The Xerox 6085's monitor and card solve this problem by running on a 19-inch

There's nothing standard about this corporate standard.

The standard is MultiMate Advantage.™

The word processing software program found on the "approved" list of most major companies.

Corporate standard aside, MultiMate Advantage also lives up to people standards.

Because it lets you customize to fit your needs.

For example, with the new columnar feature, creating up to eight columns on the screen is no longer wishful thinking.

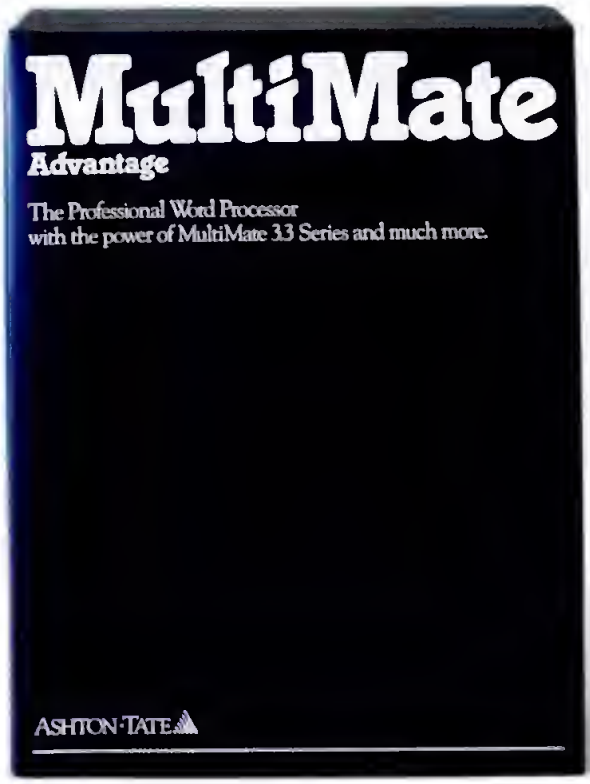
Neither is printing those columns on a single page. In fact, MultiMate Advantage supports over 350 different printers.

It also supports a new 40,000-word thesaurus. As well as a 110,000-word dictionary (complete with medical and legal jargon), which you can easily customize to include your own frequently used words.

And if you still need more reasons why this corporate standard isn't standard, look no further than MultiMate Advantage's keyboard. It's been specially designed just for word processing.

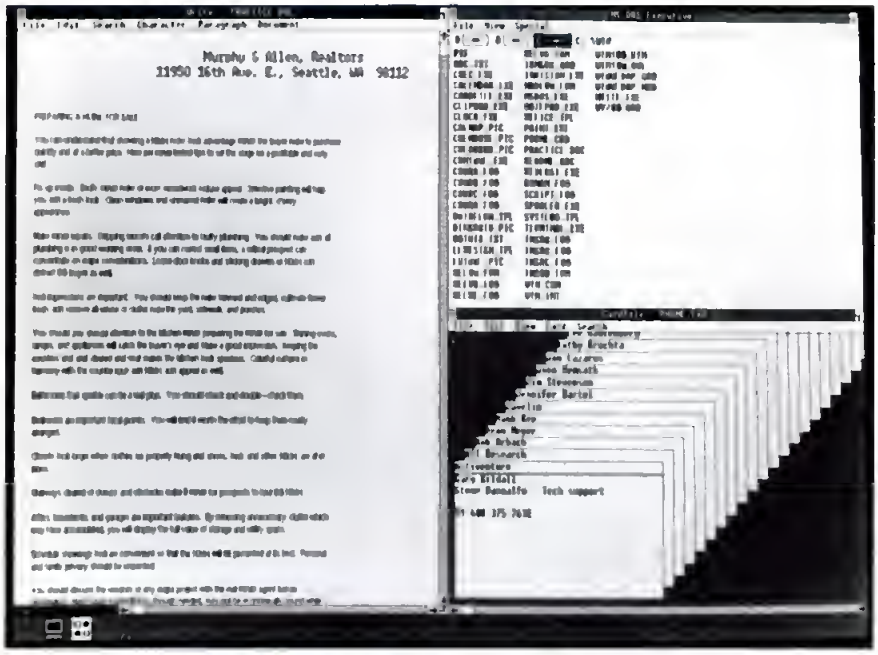
For the name of your nearest authorized Ashton-Tate dealer, call (800) 437-4329, Extension 234. And get your hands on MultiMate Advantage.

It's the first word processing program good enough to live up to everyone's standards.



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CIRCLE 210 ON READER SERVICE CARD





When running Microsoft Windows *on the Wyse WY-700 (above), you can fit a full page of readable text on-screen, with plenty of room left over for other applications windows. The Wyse WY-700 comprises a 14-inch, black-and-white monitor with 1,280 by 800 resolution, teamed with a display adapter. Add the pair to your AT (left), and you've given it some of the crucial capabilities of a workstation.*

screen. This is really the optimum size for a business workstation: you can put up two pages of text or one page and a bunch of smaller windows.

AN INTEGRATED ENVIRONMENT

Microsoft Windows and *GEM* are the only graphics environments available for the PC today. *GEM* is a handsome environment, more attractive in many ways than *Windows*. It is limited in that it only single-tasks, except under Concurrent PC-DOS, which isn't mainstream enough to win the hearts and minds of users.

Windows, too, has limitations. Its multitasking is limited to applications that write to the screen. The *Windows* desktop applications, while quite a value for $99, are limited and limiting. They don't accept redirection; the clipboard is limited in scope and flexibility; and there isn't a macro processor to tie them all together.

Neither *GEM* nor *Windows* makes sense as an integrating environment for existing PC applications because today's applications are generally character-oriented. Without windowing, scaling, font control, and a virtual interface, a big screen only benefits users with bad eyesight.

Big graphics screens show another weakness in the PC: speed. Vector-oriented programs such as *In*A*Vision* do a decent job of drawing in a field of a quarter of a million pixels, as on the EGA. Even on an 8-MHz AT, they're much more than four times slower when the screen size gets up into the million-pixel range. The answer is increased hardware speed. The next generation will certainly have faster processors, but the real increase in drawing speed will come from specialized graphics hardware. One of the promising new graphics chips is Intel's 82786, widely known as the P6. It will offer high-resolution color graphics and will considerably speed the display process. Although the P6 is incompatible with existing standards, the manufacturers who bring it to market in board form will likely include an EGA compatibility chip set so that the board will run today's software, as well as tomorrow's.

It takes more than a big screen to make a workstation, just as it takes more than a windowing environment to make DOS perfect. Hardware and software must work together synergistically. All the pieces are in place, but it's going to take effort—and users who know what they want—to make it happen.

DOS and the workstation have met, and neither will ever be the same again. While the technical workstation companies haven't got a clue, Xerox's 6085 is a lens through which we can see the PC of the future. And it's available now. □

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Wyse WY-700
Wyse Technology
3040 N. First St.
San Jose, CA 95134
(408) 946-3075
List Price: $1,595 (monitor and display adapter)

CIRCLE 085 ON READER SERVICE CARD

"...Sherman tank of hard disk drives."



-InfoWorld
July 22, 1985

HAVE A NICE INQUISITION, DEAR.

When Infoworld's contributing editor, Bernie Zilbergeld and the InfoWorld Review Board said they reviewed our ATplus20™ hard disk drive, we figured that they gave it the routine technical and performance diagnostics.

We didn't expect *destructive* testing.

They went after our legendary resistance to head-crashes with a vengeance.

HOW TO HENCH.

Mr. Z and his henchpersons began by subjecting the drive to 3,500 stops and starts.

Having survived this, our ATplus20™ drive then had to face increasingly severe physical torture *while* performing a seemingly relentless series of track seeking operations.

THINGS THAT GO BUMP IN THE DAY.

Further henching resulted in their bumping the table that the ATplus20™ was running on.

Then they *dropped* one side of the table from a height of six inches.

Next, the entire table was lifted one foot above the floor and dropped.

After cutting power to the drive (thus interrupting the seek test) they bumped the table severely, to see if the ATplus20's unconditional and automatic park and lock feature really makes a difference.

Then, they threw the book at us.

Actually, they dropped a rather heavy book *directly* on top of the drive itself.

GUESS WHAT?

You're absolutely right.

CORE's ATplus20™ hard disk drive not only survived, but continued to perform as specified.

Each of the rather unnerving tests was repeated a number of times on the same drive, just to be extra sure.

Or mean.

THE LAWYER'S 2¢.

The tests were so nasty that they had to publish the following warning:

"We caution you not to perform any of these tests on your own equipment."

We have to agree.

These tests were done to determine the limits of the drive, and were intentionally extreme beyond the normal use environment.

SEAL OF APPROVAL.

We're delighted that InfoWorld tested, evaluated and *validated* exactly what we have been saying all along: *Now you can build the enhanced PC-AT that IBM didn't.*

DOS, XENIX & MORE.

Along with the highest *reliability* among PC-AT compatible drives, we offer *full compatibility* with PC-DOS 3.0 and higher.

And XENIX™ compatibility with CORE's ATplus™ XENIX update.

A significant number of ATplus drives are running under the IBM, NOVELL and other networks.

Those users are delighted with our speed and performance.

PEACE OF MIND.

ATplus™ drives come with a full one-year warranty, supported by CORE and other major maintenance service companies.

Thus, we offer you a choice of on-site, local, or exchange maintenance services.

Known as CORE's Sudden Support™, all services are extendable to your entire AT system, and after the warranty runs out.

WE'LL BE AROUND.

We're the world's largest supplier of high-performance PC-AT compatible hard disk drives.

Now, respected magazines such as InfoWorld and PC Magazine have told you how we got there.

Please contact us directly for full and unedited reprints of this and other prominent computer magazine reviews.

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C&C Computers and Communications

Your first color monitor should be good enough to be your last.

NEC introduces the only color monitor you need. Superb resolution plus MultiSync for across-the-board compatibility with all three PC graphics boards made by IBM,® for business graphics, CAD/CAM, computer art, and text.



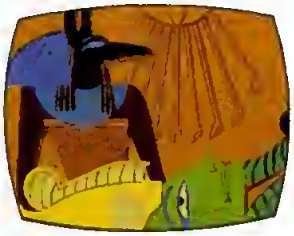
Now there's one high resolution color monitor that does things your way. The MultiSync™ monitor from NEC.

It gives you the best color resolution available at the price.

- Compatibility with the IBM Professional Graphics Adapter, the IBM Enhanced Graphics Adapter, and the IBM Color Graphics Adapter.



Compatibility with the IBM® Enhanced Graphics Adapter Board

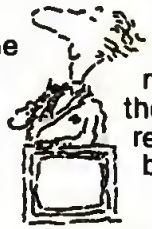


- MultiSync, the NEC feature that automatically adjusts to color adapter board scanning frequencies from 15.75 KHz to 35 KHz—suggesting the possibility that the MultiSync monitor might be compatible with *all* color graphics boards that are fully compatible with the IBM PC, PC/XT, and PC/AT, now and in the future.
- Full implementation of high resolution graphics software for business and other applications, now and in the future.
- And color capability limited only by the board being used.

See Things Our Way

Until now, you had to choose different color monitors for compatibility with all three PC color graphics boards made by IBM. With so many board and monitor configurations, folks didn't know which way to look.

The new MultiSync color monitor gives you unique compatibility. As well as TTL and analog color. With 7 switchable text colors. And resolution up to maximum 800 horizontal dots and maximum 560 vertical lines, on a large, 13" diagonal viewing area.



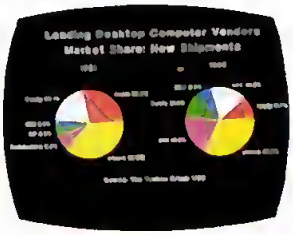
All that, priced at just $799. All from NEC, a name respected around the world for advanced, reliable products backed by nationwide service.

Compatibility with the IBM® Professional Graphics Adapter Board



It's the one color monitor that does everything your way.

Compatibility with the IBM® Color Graphics Adapter Board



But why talk more about it? Visit your nearest dealer and see a graphic demonstration of the new NEC MultiSync monitor's capabilities. Then draw your own conclusions.

For information dial

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NEC

CIRCLE 168 ON READER SERVICE CARD

INTEGRATION WITH INTEGRITY: Framework Symphony and Enable

After a devastating shakeout in the integrated-software market, these three durable names head the list of survivors. Good individual modules and well-designed integration are two keys to their success.

The integrated-software market has seen dramatic ups and downs. Just 2½ years ago, it was the fastest-growing software category, with new products released nearly every week. Manufacturers soon discovered, however, that many users were unwilling to part with their familiar, if not always beloved, standalone applications programs. The number of integrated packages on the market soon dwindled.

Framework, *Symphony*, and *Enable* were released late in the integrated race—late enough for their developers to have learned some valuable lessons from the failures of less-fortunate products. All three packages have done more than merely endure: they've thrived.

What makes these survivors unique? Why should (or shouldn't) you scrap your *Acme Whizbang Word Dicer* and your *Peerless Number Spreader* programs in favor of an all-in-one package? These are the questions that motivated *PC Magazine's* comparison of *Framework*, *Symphony*, and *Enable*.

We put the three programs through a typical cycle of database, spreadsheet, graphics, and word processing tasks (see sidebar, "A Fair but Challenging Test"). (We also tested the programs' communications and programming capabilities; see sidebars, "Integrated Communications" and "Integrated Programmability"). While a clear winner emerged (see Editor's Choice), none of the three is ideally

equipped to tackle every type of assignment you'll want to hand it. Each product has its own personality and philosophy, and each is best suited for a different type of work.

Enable, Version 1.1, is the only one of the three with serious database capabilities, in that it can both link tables easily and format complex reports quickly. Its spreadsheet is serviceable, and its word processing module has plenty of power (as long as you get along with its "different" approach). *Enable* is your best bet if you truly want just one package on your desk, but be prepared to learn many commands.

Framework II is the standout word-smith's tool. After taking copious review notes with each package (windows do have their advantages), I did not consider writing this article with either *Enable* or *Symphony*. *Framework*'s word processor is reasonably fast and intuitive, it has a spelling checker, and its outlining capabilities are a natural for complex assignments. The spreadsheet is good but slow, and the database capabilities are too limited to credit.

■ *Enable* is the only one of the three with serious database capabilities: it can link tables easily and format complex reports quickly.

Symphony, Version 1.1, shines in the spreadsheet area, which is no surprise considering its Lotus heritage. Given enough time, you can probably learn how to make it do anything, including complex database reports and fancy documents. These facilities are at the top of a long and steep learning curve, however, so plan for a lengthy trip before you set out to become proficient with it. The word processor has some irritating features and can slow to a crawl, so don't choose *Symphony* if you plan to do lots of writing.

DATABASES

■

ENABLE

Only *Enable* has a database system capable of performing complex work without a lot of esoteric understanding on your part. You can set up files and work with them in much the same way as you would with other database programs.

This familiar approach left me unprepared for the surprises I later encountered. My first collision with harsh reality occurred when I tried to define my sample data file. I had opened a word processing window to record my notes, but *Enable* informed me that all windows must be closed before I began database definition. The same is true for data form and report definition. While this is not a fatal limitation, it does compromise the integration of the program's modules.

After saving my notes and other work and closing up my other windows, I was able to start on the data file definition. Here I was in for a more pleasant surprise: *Enable* presented me with a chart for the field details and prompted for a field name. After I entered a field name, it took me to a new screen that offered a choice of quick or detailed definition methods. Quick lets you select field type (integer, decimal, text, or logical) and specify a field length, and then it returns to the original screen to ask for another field name.

Choosing a detailed definition starts a series of branching questions that allow you to specify your needs far more comprehensively. You could specify a field as a key field and restrict it to accepting unique keys. You can make it a required field and have the data come from the keyboard, another file, a calculation, or the system (for time and date stamping). Within fields you specify as numeric, text, logical, or other, you can make other selections such as currency, letters only, letters and numbers, date, time, state code, ZIP code, or phone number. *Enable* will automatically verify entries against the U.S. Postal Service two-letter state codes if you select that type. If none of these serve, you can create a text field with your own entry-edit mask, using six different masking characters.

Most field types permit you to enter a minimum and maximum possible value. Some let you specify a minimum or maximum length. In the date and time fields, you can list the minimum and maximum values and then specify the earliest and latest *reasonable* values to be permitted. *Enable* will accept entries between these reasonable limits and the absolute limits, but it will display a warning message to make the operator aware of the discrepancy.

You can compose your own error message text in many cases, and you also can specify a columnar report heading for a field; this heading will appear on reports instead of the field name.

These features give you more control over the field definition of your database than you get with many standalone database programs. You can link tables through the derived field option, adding table-lookup power to the program. This would be impressive enough, but *Enable* goes on to add custom input and report forms.

You develop input and report forms similarly. After you specify the database to be used, *Enable* presents a blank screen. You then use a full-screen editor to "paint" the prompts on the form and a "put it here" key combination (Shift-F9) to place the fields. On input screens, you can require a field to be typed twice for verification purposes (a pain to use in practice, but it does make critical data entry more accurate). You can specify whether the data should be repeated on the next screen field by field, a feature I have sometimes wished for in dedicated databases costing more than this entire package. On the report forms, you can also embed commands to control the output and to automate some complex operations.

I skipped the report forms for the moment and created an input form to go with my database. The entire process was smooth and intuitive. Now all I had to do was import the 500 records in the *PC Mag-*

azine test database, which contains typical employee information, and try it out.

At this point, I hit a major wall, and the manual didn't offer me much help in scaling it. The only information in the text read, "FILE. This selection allows you to copy data from a disk file containing ASCII data or files created by other programs." Did that mean fixed-length records, or comma-delimited, or what? The program would build an entire database directly from reading a *dBASE II* file, but I didn't have my data in that form. I decided to try the ASCII technique on the comma-delimited version of my test database.

Enable read in the 500 records, but when I tried to look at them, nothing was there. I stumbled upon the answer in an errata page that was bound into the database manual behind the title page. Back on track again, I imported the 500 comma-delimited records without incident. The process is a little tricky: you must specify which field corresponds to which section of the imported record in terms of position and length. I later imported a set of corporate departmental records using a fixed-length record format without any trouble.

The nicest surprise in *Enable*'s database is the columnar report feature. You don't have to prepare report forms in advance; you can create complex reports all from a single input screen. You select the destination, the source, the index (if any), and selection criteria. You can set up complex selection criteria using the standard inequality operators, wildcards, and typical Boolean logic operators. You can even set up criteria based on the indexed field, resulting in lightning-fast searches and selections that can cut report times in half.

The real power is evident when you format columnar reports. You select the fields to be printed. Then, by putting simple information in brackets after the field name, you can specify the length of the field, whether it is to be used for breaks, subto-

A FAIR BUT CHALLENGING TEST

Reviewer Alfred Poor designed standard tasks for each integrated program module to bring out its best—and worst.

To thoroughly test *Framework*, *Symphony*, and *Enable*, I set up some tasks that would give each module in all three packages a chance to show its stuff and that would also push them to their limits. These sample exercises were intended to reflect actual workplace requirements.

I used a *PC Magazine* test database for a fictitious corporation with 500 employees in five divisions. This data took the form of a pair of ASCII files: a fixed-length record version and a standard comma-delimited, quoted string version. I imported one or the other into each program's database module, depending on its import capabilities. The 500-record file gave me ample opportunity to see how the program responded while sorting and selecting over a medium-sized file, but the database was also large enough to tax memory capacity with some of the packages.

After some ad hoc queries and simple reports with the database, I moved the employee data to a spreadsheet. There I made some statistical calculations and projected salary increases based on different criteria. I also built a summary table of total salaries by department.

This table was then the basis for a pie chart and bar graph. I imported a memo and tried to include the bar graph and the summary table in the memo so that they all printed out on the same page. Only one package managed to place the table next to the graph.

The final step was to import a form letter and then link it with the database to print out letters for selected employees. This task gave me a chance to check out the programs' mail-merge facilities and page-formatting capabilities.

List management, spreadsheet forecasting and analysis, reports, and form letters are fairly typical tasks for most offices; the only difference from one office to another is usually the mix of these jobs. The results of these tests should help you pinpoint which program's strengths best match your office's workload.—**Alfred Poor**

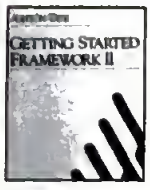
PC MAGAZINE FACT FILE



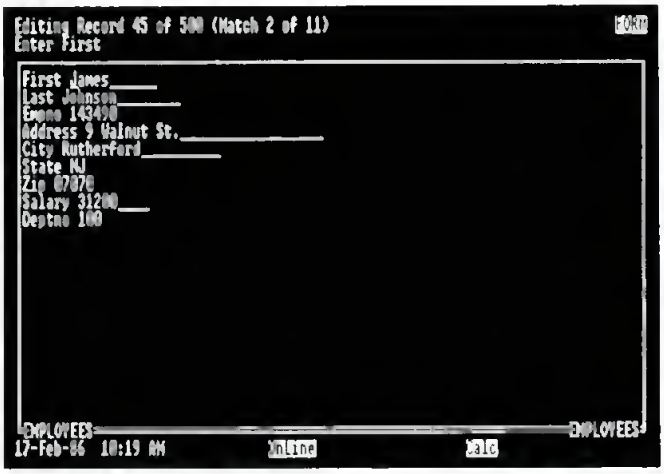
***Enable*, Version 1.1**
The Software Group
Northway Ten Executive Park
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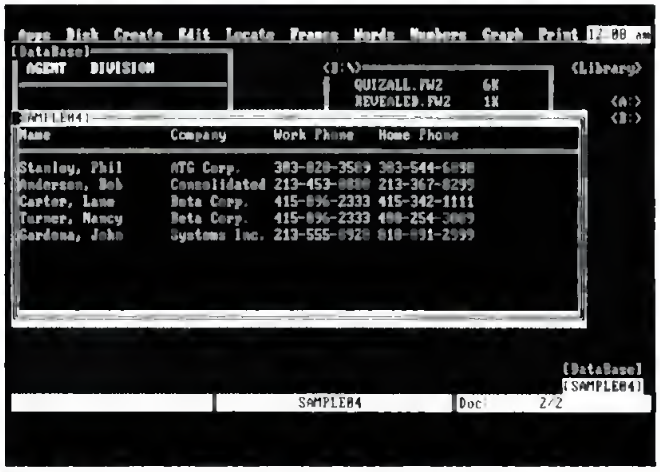


***Symphony*, Version 1.1**
Lotus Development Corp.
55 Cambridge Pkwy.
Cambridge, MA 02142
(617) 577-8500
List Price: $695
Requires: 320K RAM, two disk drives, DOS 2.0 or later.
In Short: Although packed with features, *Symphony* unfortunately makes it difficult for you to make them work. The spreadsheet is easy to use and the fastest of the three, but you must invest many hours to take full advantage of the power of the other areas. Copy protected.
CIRCLE **691** ON READER SERVICE CARD



Framework II
Ashton-Tate
10150 W. Jefferson
Culver City, CA 90230
(213) 329-8000
Price: $695
Requires: 384K RAM, two disk drives, DOS 2.0 or later.
In Short: The word processing functions carry the weight for *Framework*, but its slow spreadsheet and limited database functions weaken its overall utility. Copy protected.
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In Symphony *(upper left), you invoke database functions inside the spreadsheet. To record the data entered here, you press the Ins key.* Framework*'s database (above), also based on a spreadsheet, lets you look at data in three ways. Shown here is the spreadsheetlike "table" view.* Enable*'s database (lower left) takes a conventional approach, but when you get beyond the familiar input form, some surprises are in store.*

tals, counts, and other summary statistics. You can also specify a calculation based on a field, resulting in the creation of a "virtual field" on the fly as the report gets produced. These sophisticated features are clearly explained in the manual and are easy to use since you do most of the work simply by highlighting a choice on the screen and pressing Enter.

FRAMEWORK

Framework's "database" is as disappointing as *Enable*'s is surprising. It would be charitable to say that *Framework* has a spreadsheet facility specifically designed to perform some database functions. A less-generous description would characterize it as a spreadsheet window that has been hobbled to work just in columns and that is nearly useless for doing list management.

The frustration begins when attempting to import files. Believe it or not, *Framework* has no way at all to handle a fixed-length record. The documentation makes few references to file importing at all. An incredulous call to Forefront (the developers of the program for Ashton-Tate) yielded the response that "it would only take about half an hour to write a FRED program to do that." (FRED is *Framework*'s programming language.)

Eventually, I stumbled upon the way to import files: You must use comma-delimited, quoted-string format. *Framework*'s Disk Import ASCII command creates a word frame (*Framework* groups data in windows it calls "frames"; see the word processing section for a fuller explanation of how the frame concept works) and loads the data into it. If the file is large, as mine was, *Framework* automatically splits it into two or more subframes. You then set up your database frame (specifying sufficient rows for the records you are adding, allowing for the extra rows taken up by the heading lines). Then go back to the word frame, select a subframe's worth of data, and copy it into the database frame. This not-very-intuitive process takes lots of keystrokes.

You cannot index the table, although you can sort on any one field. If you need sublevel sorts, you must sort on the least significant field first, then on the next highest, and so forth until you reach the primary sort field.

For selections, you must enter a criteria formula in the frame of the database. To do this, you must put a FRED statement into the border of the window, which then governs the behavior of the frame's contents. This design feature is fairly consistent throughout the program, and it takes some getting used to. The selection statements also take some adjustment. To select all records from California, you would embed the command

```
state="CA"
```

More-complex queries require the at sign (@), usually associated with spreadsheet functions. To select all employees named Smith from Califomia making more than $20,000, you would embed

```
@and(name="Smith",
  state="CA", salary>20000)
```

That statement makes sense, but it is somewhat different from most programs' query syntax. There is no easy way to create selection criteria forms.



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Framework's report generator limits you to printing columnar reports of the entire list or selections. It has no formatting functions, such as subtotals, breaks, or summary functions. These could probably be achieved through programming with FRED, but that will be beyond most users.

Framework offers three fixed "views" of the database. The first, a straight table view, looks like a spreadsheet. The "*dBASE* view" lists each field on one line, with spaces for the data from a single record, and the "forms view" gives the same information with one field per frame scattered about the screen. If you choose the forms view, you can drag the frames around the screen to arrange them into an input form. This option is cute but useless; the cursor jumps around from field to field in the same sequence as in the database table, so that the effect of a custom input screen is all but lost.

The *dBASE* view is slightly more useful. It managed to lull me into thinking I was working in a database, when in reality it was still a spreadsheet. I came back to earth when I tried to type in an address: when I typed in the number and then the street, I got an error message. It seems that *Framework* can't tell which fields get numeric data and which get text, so it tries to evaluate the data you enter as if you were entering it into a cell. When you press Enter after finishing the data in a cell—I mean field—the cursor just sits there. You must press Enter a second time to make it advance to the next cell, or field. This is consistent with the way the cursor behaves in *Framework*'s spreadsheet, but it is not typical for data entry in a database program.

Framework's system of putting each spreadsheet cell in its own frame makes it a memory hog. The database, because it is simply a type of spreadsheet, has the same voracious appetite. My 500 records took up about 43K bytes as a word frame. Imported into a database, the same information swelled to an incredible 200K bytes. Since all that data must remain in memory, things get cramped quickly. *Framework* buffers its overflow to expanded memory or to a disk if available; this can be a satisfactory solution if you are using an expanded memory board, but performance is very slow if you try to buffer to a hard disk.

SYMPHONY

Symphony goes one step beyond *Framework* in using a spreadsheet as the metaphor for the database structure. The database, along with everything else in *Symphony*, is built using the program's spreadsheet.

To use a database in *Symphony*, you set up a section of the worksheet to hold the fields in columns and the data in rows. The database is managed by a set of ranges that you define above the table of data.

The first range defines a form that you will use for data entry, selections, and other operations. The default arrangement is one field on each line, with dashes indicating the field size. Below that is the range in which the fields are defined, and then in the rows below that are the ranges in which the current record is stored and a section for holding selection criteria. This setup is as confusing as it sounds, but you don't really need to understand it because *Symphony* will let you define a database from some menu choices. Provided you stick with the "form" display of your window, you should be able to work with your data fairly easily.

■ *Framework*'s system of putting each spreadsheet cell in its own frame makes it a memory hog. The database has the same voracious appetite.

I didn't want to build a table from scratch, however; I wanted to import a file. I started by bringing in the comma-delimited version of my data file (*Symphony* can't deal with the fixed-length record format) and putting it down 50 rows from the top of my window. The magic number for file imports is 240. For a database file, the total record length must not exceed 240 characters (excluding the commas and quotation marks) or the import procedure will abort. A similar restriction applies to text files that you import into *Symphony*'s word processor.

Symphony lets you work in only one worksheet at a time: All your windows are simply different views of the same work area in memory. You must clear your worksheet before you can load another. This is quite different in concept from *Framework*'s independent frames or *Enable*'s separate windows onto separate files.

Each time you open a file, you must define the section to be used by that file's part of the worksheet. I set aside a section to hold the 500 records with the extra 50 rows at the top, plus another 50 at the bottom. As it turned out, I did not allow too much extra space—the database generation sequence used all but nine lines of that top space. I was able to quickly "attach" my imported records to the database by redefining the range for the data section, and I was then able to edit the records using the form view. Although I found this process easy because I was already somewhat familiar with *Symphony*'s database concepts, I did not find it explained in the manual; a novice might have some trouble figuring it out.

Entering data using the data-entry form is straightforward and easy. Unlike *Framework*, *Symphony* knows which fields are text and which are numeric. It even understands date fields. The only quirky detail is the program's requirement that you press the Ins key to record the data you have entered, but this is similar to the requirements of many standalone database packages and should not be difficult to learn.

The manual does mention "multiple-pass" reports, which sounded like the ticket for creating the reports with subtotals and record counts on breaks that I wanted to produce as part of the standard database task I created. I tried. I read the manual again and searched for an example to emulate. There was a keystroke-by-keystroke illustration using a sample file on the disk, but the results were not illustrated. I imagine that it can be done, but I confess that I gave up, figuring that I would accomplish the same result using the spreadsheet functions.

I turned instead to the selection criteria facilities in order to try some ad hoc que-

ries of the database. You enter the criteria on the data input form, but instead of just giving a conditional operator and a value, you must enter a formula. The formulas are the same powerful ones you would enter in a spreadsheet. You can perform string functions, comparisons with other fields contained in cells referenced by relative or absolute addresses, and even have multiple criteria on the same field. You can create multiple-criteria records, and *Symphony* will evaluate each record in turn to see if it matches any of the criteria specified.

After the program informed me repeatedly that I had made an invalid request or that no records matched when I knew that it should have found about 100 records, I finally got the hang of making queries. My subsequent searches were fast and effective.

■ *Symphony* lets you work in only one worksheet at a time: All your windows are simply different views of the same work area in memory.

According to the documentation, you can redesign the data-entry form to put the fields in different orders, and you can create default values, computed fields, and validation rules. You can create your own prompts for the fields. You can even add or delete fields from the database. However, in practice these tasks are not automatic by any wild stretch of the imagination. When you perform maneuvers such as block moves, insertions, and range redefinition, which *Enable* handles by prompting you with a series of questions, *Symphony* makes you take charge.

Symphony offers considerable database power, but you will need to be thoroughly familiar with the functions and the database design philosophy before you can begin to tap its potential.

SPREADSHEETS AND GRAPHICS

■

SYMPHONY

Symphony's forte is the spreadsheet, as its heritage would lead you to expect. Performing the standard spreadsheet task I developed was not particularly taxing, since it used simple functions and logic. I found it easy and fast to maneuver around the worksheet and made my changes directly on the data contained in the database range.

I also created a column to calculate new salaries for the 500 employees based on a variable breakpoint and then made a summary table for all five departments that the employees are assigned to in a separate area of the window. Recalculations were refreshingly fast; it was no hardship to try out multiple raise rates and breakpoints.

To test the recalculation speed on all three spreadsheets, I used a simple benchmark test: after putting a 1 in the upper-left-hand cell, I defined each cell to the right as 1.1 times its neighbor to the left, or 1.1 times its neighbor on the row above. I then filled ten columns and 100 rows with these formulas and timed the program until it let me type again after I entered a new initial value. *Symphony* was the hands-down winner, blasting through at just 5.5 seconds.

Since *Symphony* does everything through its spreadsheet, it is not surprising that the spreadsheet has 90 different @ functions. These cover everything from statistics to financial functions, date math, and string manipulation. As an exercise, I helped a friend put together an insurance-policy estimation sheet that made use of many of these functions. It began with a person's date of birth and calculated years to retirement. This worksheet required information about current salary and target insurance value, and it made some different calculations based on a complex comparison of values. *Symphony* handled the task smoothly.

Like *1-2-3*, *Symphony* draws its graphs quickly and with myriad options and features. It was able to produce both the bar graph and pie chart that I wanted, although it does not have a three-dimensional bar-chart option. The graphs were clear and attractive, but there is no way to incorporate them into a text area in order to print them as part of a memo or report.

In fact, there is no way to print the graph from within *Symphony* at all. You have to save the graph image, exit the program entirely, and then run the included PrintGraph program that is familiar to *1-2-3* users. This process is so much more difficult than the way in which the other two packages handle printing graphs that you should probably drop *Symphony* from consideration right now if you intend to use graphs with documents or spreadsheet reports.

On the other hand, incorporating spreadsheet data into a document is extremely easy. Since you perform word processing on the worksheet itself anyway, you can simply use the spreadsheet view to gain access to individual cells and reference them to cells or ranges of cells in other parts of the worksheet. Changes made in the individual rows will automatically affect the summaries in your report after you recalculate.

Symphony makes it easy to convert your *1-2-3* worksheets into *Symphony* files, since it can read both .WKS and .WK1 files. This compatibility is a one-way street, however, since it cannot save files in that format.

ENABLE

Enable's spreadsheet is neither as powerful nor as fast as *Symphony*'s, but it nonetheless holds it own.

Enable can read *1-2-3* files, and it goes *Symphony* one better by handling *VisiCalc* and .DIF files too. It can use *1-2-3* worksheet macros, although some modifications may be required. You can save your

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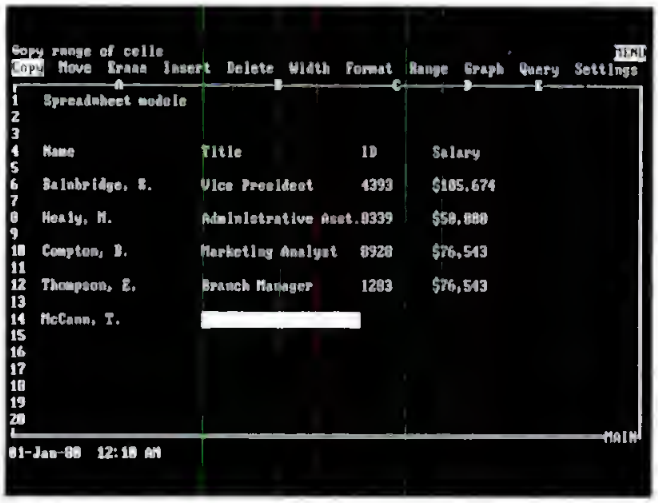


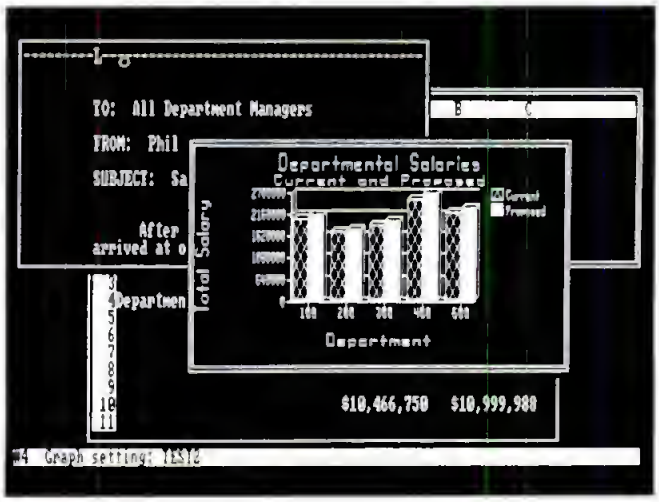
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Symphony's spreadsheet module (above) will make 1-2-3 *users feel right at home. It is easy to use even though it offers over 90 functions.* Enable *(upper right) lets you "cut and paste" data, text, and graphs from the other modules into the spreadsheet to create integrated reports. In* Framework *(below), you can link two spreadsheet frames or link a spreadsheet with a graph frame, so that changes to one affect the other.*



work as an *Enable*, *1-2-3*, or .DIF file, a feature that gives you real flexibility in sharing information with other programs.

One interesting feature of the *Enable* spreadsheet is that you can adjust its dimensions. It defaults to 255 rows by 255 columns, but you can select alternative dimensions: 511 by 127 columns; 1,023 by 63; 2,047 by 31; 4,095 by 15; or 127 by 511. You may redimension the spreadsheet at any time, provided that all the data lies within the new dimensions.

The spreadsheet works with the familiar slash (/) command trigger, followed by a series of top-line menus similar to *1-2-3*'s command menus. In fact, many of the commands will be so familiar to *1-2-3* users that they could probably start working with this part of *Enable* without consulting the manuals at all. While *Enable* only provides 60 @ functions, two-thirds as many as *Symphony*'s, these functions cover most of the territory. In fact, I was able to create the same complex insurance spreadsheet as in *Symphony*, with almost no difference in the formulas at all.

While it was not as fast as *Symphony*, *Enable*'s performance on my recalculation test was still acceptable. It took nearly twice as long, 10 seconds, to update the 1,000 cells.

The biggest strength of *Enable*'s spreadsheet is its integration with the other modules. You can "cut and paste" data between any two windows, a feature that is handy but limited. For the standard task, I wanted to bring in data from the database to work on. A special menu option handles this operation: you define your selection criteria in the database first, then go to the spreadsheet and tell it to grab those records. The imported data can be used to overwrite existing cells, or you can insert it in the existing spreadsheet. It works quickly and cleanly.

Graphing is also easy. Not only can you create a graph from a spreadsheet, but you can also use database data directly. In addition to the standard bar chart, pie chart, high-low, and line graphs, you can also produce extremely attractive three-dimensional bar charts (this is the only one of the three packages that has this option). You control the printed size of the graph by sizing the window in which it is drawn.

Once you have created your spreadsheet and graph, you can paste either or both onto a document. If you have a graphics monitor, you can see the graph right in with the text; if you don't, the graph appears as a shaded block. *Enable*'s unique ability to add text right next to, and even over, the graph that you import to a document makes for attractive and informative reports. I printed mixed graphics and text documents on an Epson FX-80 and an Okidata 92. The Okidata driver resulted in a slightly wider graph, even though it was printed from the same file, but both printers produced presentable results.

FRAMEWORK

Framework's spreadsheet stands alone for a variety of reasons. Because each cell is a frame in itself, you can put large formulas—even entire programs—in their borders.

INTEGRATED PROGRAMMABILITY

These packages get their extra kick from built-in programming facilities that range from keyboard macros to a full-fledged language.

One characteristic that sets *Symphony*, *Framework II*, and *Enable* apart from most of the integrated software crowd is their programmability. All three have potent keyboard macro facilities, and *Framework II* and *Symphony* have their own programming languages as well.

Framework II's FRED and *Symphony*'s command language are powerful programming tools, each with certain advantages and drawbacks. You'd have to explore each system thoroughly before you could assert that one is better than the other for a specific application. *Enable*'s programmability is limited to macros and menus, but there are few tasks that *Enable* cannot handle efficiently.

ENABLE'S MACROS *Enable*'s "programming utility" is its keyboard macros. An *Enable* macro is a sequence of keystrokes that you have saved to memory (short-term) or disk (long-term), from which you can recall it at any time. The keystroke series, containing commands and data, typically represent your responses to the menus and choices *Enable* offers during manual program execution.

Enable allows you to create macros in three ways: you can record keystrokes during the execution of an *Enable* task, record keystrokes without executing them, or use the system's master menu and word processing system.

Enable uses the Alt-F9-Backslash combination as the "recorder on" switch. You name a macro by typing any alphabetic character immediately after the backslash. For example, Alt-F9\a tells *Enable* to begin recording all your keystrokes into a macro named "a." *Enable* stops recording when you hit the End key on the numeric keypad.

Let's say you want to automate the repetitive task of getting a spreadsheet's column and row headings in place. The easiest way to turn this task into a macro is to perform it the first time with the macro "recorder" turned on. You go to the spreadsheet as usual and make all the regular entries for column heads and row names and even put in formulas where they will always be the same. But immediately before you start typing in the spreadsheet, you turn on the keystroke recorder. When you are done, you turn off the recorder. Now all your keystrokes are recorded to disk, awaiting your command for instant replay.

■ FRED is a collection of functions that combine to let you program within *Framework II*.

While the concept of macros is simple, the work they can accomplish is prodigious. When this macro facility is combined with *Enable*'s menu generation capability, the programs you create can be quite sophisticated.

MEET FRED *Framework II*'s advanced features manual describes FRED as the programming language in which all *Framework II* formulas and programs are written. More to the point, FRED is a comprehensive collection of functions that, when combined, let you program within *Framework II*.

Strictly speaking, a function is a routine that returns a value of some sort, such as a string, integer, number, dollar, or date. The value returned by the function is based on the function's operations and its parameters. Parameters, sometimes called arguments, are the information on which the function acts.

Most of us are familiar with functions in BASIC or perhaps *VisiCalc* or *1-2-3*. In many spreadsheets, for example, @sum(A1..A5) means "return the value of the sum of cells A1, A2, A3, A4, and A5." A similar function in FRED is @sum(A,B,C), which returns the sum of values represented by A,B, and C. A, B, and C can be constants, variables, expressions, other functions, or "frames."

Framework II's frame concept extends even into the programming language. Imagine that each frame has a flip side that can contain one or more programming statements. The contents of frames can be thought of as subroutines or procedures. The program grows in complexity as you link more and more frames and as the other *Framework II* features—database management, spreadsheet analysis, communications, and text processing—are called into play.

A SAMPLE PROGRAM Here's an example: the key combination Ctrl-C-E creates an empty frame (you can also create one using *Framework II*'s pull-down menus) that awaits a name. We'll call ours Test. F2, the Edit Formula key, puts you in the formula-editing mode, and F9, the Zoom key, puts you on the "flip side" of the new frame.

Suppose you type the following:

```
@local(first,second,sum)
first:=@value(@inputline
  ("Enter a number, then
  press Enter")),
second:=@value
  (@inputline
  ("2nd,please")),
sum:=first + second
@prompt("The sum is"
  & @decimal(sum)&
  "....Thanks.")
```

Pressing F5 (the Recalc key) enters the program in the frames formula area and begins executing it. The frame zooms back to the front side where all the action takes place. The first message appears, and a cursor awaits your response with the first number.

After you enter a number (say 8), the second prompt line will appear. If you enter another number (say 10), the screen will then display the line: "The sum is 18.00. . . . Thanks."

The first line contains a single function, @local, which tells the program that "first," "second," and "sum" are all variables local to this frame (as opposed to other named frames).

The second line shows several functions put together in such a way that they deliver a single value to the variable FIRST. Note that the function @value has as an argument the function @inputline, which has as an argument the string "Enter a number, then press Enter."

The meaning of this line becomes obvious if you work backward to unravel it. "Enter a number, then press Enter" becomes the screen prompt. The function @inputline puts this prompt on the screen and waits to receive input from the keyboard followed by a press of the Enter key. As it turns out, FRED perceives all keyboard input as ASCII strings. Since a number is needed, I used the function @value to translate the ASCII value to a number that is assigned to the numeric variable FIRST.

In the line beginning with the word *sum*, the value of FIRST plus SECOND is assigned (:= is the assignment operator) to the variable SUM. The next line outputs the sum in an attractive way. In effect, this FRED program simply prompts you for two values, adds them, and returns the sum.

The strengths and weaknesses of a function-based language like FRED are rooted in the functions themselves. Obviously, the more functions the better, and FRED has a large collection. But as you can see from the program here, functions are often deeply embedded in one another as arguments for other functions. A function-based program can therefore be confusing to read unless it is well annotated. It's also easy to lose track of the parentheses count as nesting gets deep.

One set of FRED's functions controls a macro facility that is a minor programming facility in itself, similar to *Enable*'s macro capability described above.

In addition to functions, FRED also includes all of *Framework II*'s word processing features. According to specifications, multiline formulas and programs can get as large as 64,000 characters.

A PROGRAMMING SYMPHONY

Symphony, like *Framework II*, has a powerful programming environment. Because *Symphony* is basically a spreadsheet environment, many of its programming commands have to do with cells and cell manipulation.

■ *Symphony*'s command language statements are stored in cells, and each begins with a key word, followed by one or more arguments.

Like *Enable* and *Framework II*, *Symphony* has an effective keystroke macro facility that can handle most routine repetitive tasks. However, the command language is useful when you need to create menus, screen input, or complex reports, or when you set your system up for remote communications or automatic data transfers among modules.

Symphony's command language statements are stored in cells, and each begins with a key word, usually followed by one or more arguments. Spreadsheet users will be able to work out the function of key words such as Blank, Getnumber, Getpos, Recalc, Recalccol, and Filesize. Other key words deal with program control, data I/O, and interprogram communication.

Iteration, for example, is controlled by a for-next loop like this:

```
{FOR counter-location,
  start-number, stop-
  number, step-number,
  starting-location}
```

This loop repeatedly executes the macro that begins at a particular location. The curly brackets perform the same function as the at-sign in *Framework II*: they identify the keyboard input as a system command. (*Symphony* uses the term *command* rather than *function*, but its commands work in much the same manner as *Framework II*'s functions.)

In addition to key words, *Symphony* allows the use of some 40 "key indicators," commands that are usually attached to a specific key. These key indicators include familiar spreadsheet commands such as Calc, Goto, Help, Up, Down, Right, Left, Bigright, and Bigleft. *1-2-3* users will recognize these as the Function and Keypad keys.

Key indicators are used in macros, macros are assigned to cells, and cells are manipulated by the nonkey commands. This system sounds confusing, but it plays better than it talks. Typically, *Symphony* users learn the language of their system by beginning with key indicator macros and gradually adding elements from the command language for branching within a sheet or selecting outside tasks.

Programming in a spreadsheet environment is very different from programming within a text or command file environment. Creating full-blown applications programs with menus, input screens, and complex report outputs is certainly possible, but you'll have to spend quite a bit of time working with the software before *Symphony*'s routines will come to your fingertips intuitively.—**Richard Aarons**

Richard Aarons is a contributing editor of PC Magazine.

On the positive side, this means that you have as much space as you need to write out a complex formula. You can "zoom" open the border to give a full-screen view of its contents. You can even add comments to explain how the formula was derived. You can pack pages of notes into the border, and they will just hide there until you look up the information. The strength of this capability for documenting spreadsheet assumptions is not to be underestimated.

There is a negative side, however. The biggest negative impact is on memory: files can grow to nearly five times their original size. Since there is so much more information to manipulate in memory, performance suffers. On my simple recalculation benchmark test, *Framework* crawled in with a speed of 19 seconds, nearly twice as slow as *Enable* and almost four times slower than *Symphony*. Since *Framework* recalculates databases as if they were spreadsheets, the performance issue can quickly become a source of annoyance when you use any part of the package. If you take the time to perform some of the calculations "outside" the spreadsheet, using FRED programs in the cell borders, you can improve performance.

When importing spreadsheet files, you must follow the same procedures as for importing database files, which is not surprising since the database is essentially a spreadsheet. *Framework* can also import *1-2-3*, *VisiCalc*, and .DIF files, and can write *1-2-3* files as well.

Framework's FRED programming language is built around @ functions that can handle everything from frame management to numeric formatting to page printout control—much more than just the standard calculation formulas. As a result, it has more than 150 functions available, more than *Enable* and *Symphony* combined. These functions give *Framework* plenty of power and flexibility when it comes to designing spreadsheets.

One other attractive feature of *Framework*'s spreadsheet is that it can reference cells or ranges of cells in two frames almost as easily as it can within a single frame. You can link the two frames so that whenever one is recalculated, the other frame is updated as well. There are two drawbacks to this. First, you can only create the link in one direction. Should you try to make two frames recalculate each other, you make a circular reference, and the poor thing spins around chasing itself until it gives up and tells you it can't. The other problem is that the linked sheet is not always updated completely. I found that I had to recalculate twice in order to bring both sheets up to date.

Framework's graphic capabilities fall somewhere between those of *Enable* and *Symphony*. You can incorporate a graph in a text document by placing the graphics frame between the text frames. *Framework* doesn't allow you to place text alongside the graph, as *Enable* does, but you can print the graph either alone or as part of a document without leaving the program, unlike in *Symphony*. You can easily link a graph frame with a spreadsheet just as you can link spreadsheets, so that the graph is redrawn when the spreadsheet is recalculated. With the software handling the updating, it is very easy to create automated reports that can be quickly updated and revised on a regular basis.

Framework has standard graphing capabilities, including bar and pie charts and various line graphs. One nice feature of its bar charts is that it is easy to specify which dimension is to serve as the *x* axis and which as the *y* axis. On stacked bar charts, the legend for the bars appeared in reverse order. The information was correct, but the legend for the top bar was shown below the one for the bottom bar.

WORD PROCESSING

■

FRAMEWORK

Word processing gives *Framework* its chance to shine. In its original release, *Framework* combined outlining features with complex formatting capabilities to create a formidable but difficult writing tool. You had to bury spreadsheetlike functions in the borders of frames to control printing functions. One of the main improvements in the new version is the expansion of the pull-down menus to include many of the different formatting and printout options that used to be covered by embedded functions. You can set margins and print quality from one print menu. You can even specify headers and footers from a menu selection.

The major strength of the word processing module is its outlining capabilities. The basic unit in *Framework* is the frame; each frame can contain either words, a database, a spreadsheet, a graph, or other frames. If it contains other frames, those can contain frames within them. You can move up and down within the tree-structure of frames and subframes, much in the same way that you can move between DOS subdirectories.

To make it easier to organize your frames, *Framework* offers different views. The outline view lets you see just the frame labels. Subframes are indented so that you can see their relationship to the main sections. You can "collapse" any section to hide its subtopics or open it up to show the detail. You can switch to the contents view and see the contents of the frames themselves.

In the original version of *Framework*, the transition from one frame or subframe to another in the outline mode was clumsy. When you finished working with one, you would have to leave it and move up, over, and down again into the next frame you wished to edit. The new release of *Framework* uses a beep to let you know when you have reached the end of a frame, and if you zoom to a full-screen display and press the PgDn key twice, *Framework* smoothly transports you across the invisible barrier between frames to the next frame at the same level.

A problem with computerized outlining is that it can force you to be cautious about what you say and where you say it, if it is hard to rearrange your text later. Fortunately, in *Framework* you can apply all the keys that perform copying or block-movement functions to frames precisely as you apply them to text. If you want to make more subframes, just copy one that you have in place. To move a topic up a level,

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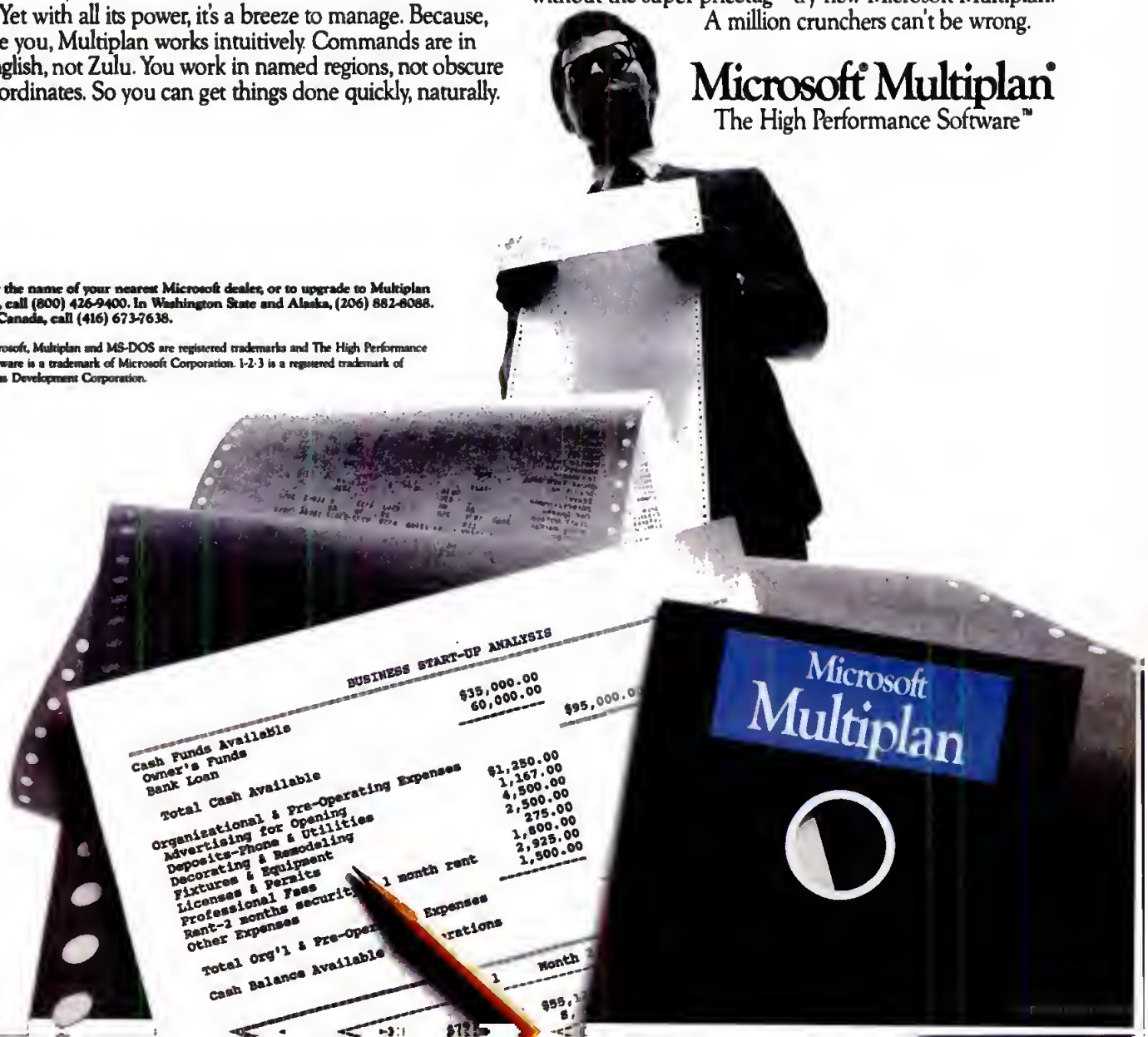
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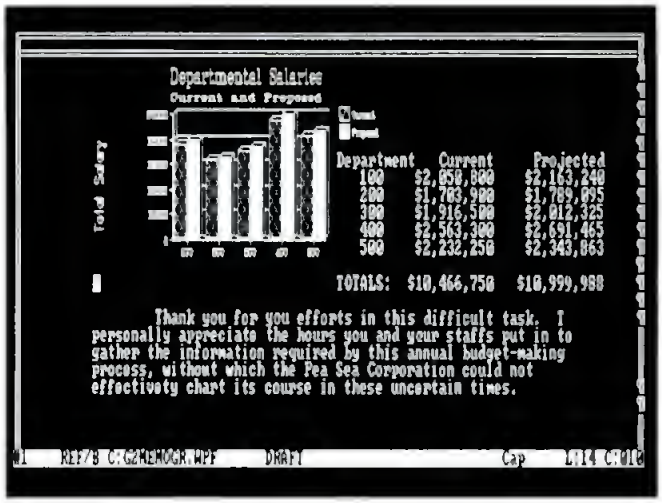
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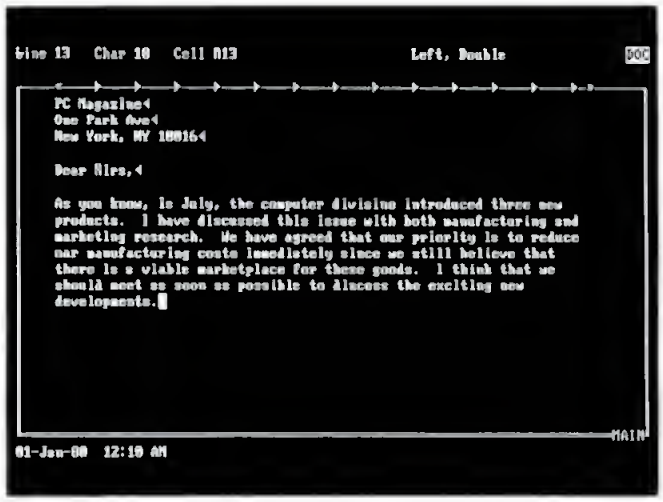
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To use Framework*'s mail-merge option (above), you put field names inside the brackets and merge the desired database frame.* Enable*'s word processor (upper right) with over 100 "expert" commands seems like a standalone package, but you can merge elements from other modules into your documents.* Symphony*'s word processing workspace (lower right) is really part of the spreadsheet, which can cause formatting problems.*

you select it and move it. As you would expect from an integrated package, you can even grab frames that are standing on their own on the *Framework* desktop and move them into your outline. These processes are intuitive and natural, and you will quickly become accustomed to them.

Importing text files for use in *Framework* is easy if your files are in the right format. *Framework* handles straight ASCII format smoothly, as long as carriage returns appear only at the end of each paragraph. If you bring in a file with carriage returns at the end of each line, you will have programs reformatting, since there is no way to search for and replace carriage returns. A built-in utility called Reformat will strip the carriage returns but will not preserve paragraph breaks. Other built-in utilities convert IBM DCA/Displaywriter, *MultiMate*, and *WordStar* files.

The *Framework* mail-merge function is also easy to use. You simply put your field names inside greater-than and less-than symbols and use a menu selection to specify the database frame to use in the merge. You can also select the records that are to be used. *Framework* reformats around the inserted fields. You cannot create a field on the fly by defining a merge field as a calculation or other formula, a feature that would be nice to have.

Framework's word processing section has lots of other useful features, such as a built-in word counter. The best of its extras is a spelling checker. Besides merely locating misspelled words and suggesting replacements, it remembers earlier replacements and offers to repeat them if the opportunity arises in the same document. It even picks up the doubled words that are so difficult to spot when proofreading. I could not find a way to get the spelling checker to start its search in the middle of a frame, and so you will probably want to wait until near the end to run the check.

Overall, *Framework*'s word processing stands up to comparison with any professional word processing program. It has the power, speed, and flexibility of many standalone packages.

ENABLE

Enable's word processor looks like a standalone product. While it shares a few function key assignments with the other modules in the package, it also has more than 100 "expert commands" that allow you to perform many operations such as block copies or deletes without going through menu selections. These commands also include font attribute selection and a variety of cursor controls.

Different expert commands are useful for different purposes; most users will probably only learn the few dozen or so they use regularly. I quickly picked up on the transposition command, Ctrl-T, since my fingers seem to have come with a built-in macro that types *teh* when I want *the*. Other commands I found useful let me modify the tabulation lines and insert a new ruler.

I had a few problems importing an ASCII file. The version with carriage returns only at paragraph breaks acted

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INTEGRATED COMMUNICATIONS

While communications capability is not central to an integrated program's functionality, it is an important consideration, especially if it falls short in unexpected ways.

If the communications modules of *Framework II*, *Symphony*, and *Enable* were standalone programs, each would qualify as a full-function communications program. The "full-function" category covers a rather broad spectrum, however, and these three programs range from barely squeaking into the category on up to being a respectable member of the breed.

FRAMEWORK

Framework II is strong both in communications features and in the integration of those features into the overall structure of the program. *Framework* offers autodialing and automatic log-on, and it can capture text and save it to disk, transfer files to and from disk, and emulate several specific terminals.

Autodialing and autolog-on are handled through setup files. You create them through a series of menus that ask you to fill in such details as the phone number and communications parameters for each computer system. The setup files also store up to ten macros per file, with the tenth macro reserved for the autolog-on sequence.

If you record user names and passwords in the tenth macro, the chore of calling and connecting to another computer is reduced to a single keystroke. *Framework* lets you automate this process to a much greater extent than do *Symphony* or *Enable*. However, you should think carefully before including your password in the log-on sequence, because the log-on information is stored where it can be read by anyone who cares to look.

The setup files also include an entry for the modem dialing prefix; it is preset for the Hayes command set, but you can change it to handle most autodial modems.

TTY EMULATION Another notable feature is terminal emulation. In addition to the standard TTY (teletypewriter) emulation, *Framework* can emulate a Televideo 920, an IBM 3101, an LSI ADM 3A, an ADDS Viewpoint, or even a DEC VT-100.

TTY emulation allows a distant computer to control your screen, but only one line at a time. Move down a line, and you can't back up. Any of these other terminal-emulation choices can give the distant computer full-screen control over your PC for graphics or text—if the system is set up to use one of these terminals. A special TWX mode lets your PC serve as a terminal on the Western Union TWX Network.

Capturing incoming information and saving it to disk always ought to be (but often isn't) a simple matter. *Framework* makes it simple. You can tell the program to capture incoming text to disk, or you can tell *Framework* to capture the text in memory, then decide later whether or not to save it to disk.

Framework also lets you move around in an active telecommunications frame and manipulate text, just as you would in a word processing frame. You can insert additional text, delete text, move blocks around, or copy them. You can also copy any portion of a communications frame into a word processing frame, a spreadsheet frame, or a database frame.

The task of transferring stock quotes or other columns of figures from a communications frame to a spreadsheet frame is trivial enough to be impressive. You only have to mark the block of multiple columns in the communications frame, choose the copy command, put the cursor in the spreadsheet frame, and hit Return. The program puts each column of figures in its own spreadsheet column, and even converts fractions in the communications columns to decimals in the spreadsheet columns. *Symphony* has a similar function, but it is nowhere nearly as simple to use.

While *Framework* is receiving text, you can leave the communications frame and work elsewhere within *Framework*. Incoming characters will still be captured, and you can read them when you return to the frame. This concurrency feature only works when you are capturing text one character at a time, not when you're sending or receiving files. As with most communications programs, *Framework* ties up your PC during a file transfer. Unfortunately, file transfer is the more likely approach for transferring large chunks of information—particularly things like *Framework* frames, which contain formatting information as well as text. *Symphony* and *Enable* each have a similar concurrency feature with the same limitation.

Framework's file-transfer function is notable for the number of error-correcting protocols it offers, thereby increasing the number of communications programs with which *Framework* can exchange files. The protocols include Xmodem, Xmodem CRC, Batch Xmodem, Clink (pronounced "see-link"), and Hayes Smartcom—not only more than either *Symphony* or *Enable* offers but also more than you'll find in most standalone communications programs.

Judged strictly as a communications program, *Framework* fares well. Judged as part of a tightly integrated package, it gets high marks indeed.

SYMPHONY

Symphony's communications module is the most limited among the three. It offers many of the same features as *Framework*, but it lacks important details.

Like *Framework*, *Symphony* uses setup files. These are created through a series of fill-in-the-blank menus, and they contain much the same information as *Framework* setup files. *Symphony* gives you the choice of dialing, autolog-on, or a kind of semiautomatic dial and log-on.

When you tell the program to make a call using the semiautomatic feature, it will put the phone number on-screen, then wait for you to confirm it by hitting the Return key. Once the connection is established, it will again stop and wait for you to tell it to log on. As with *Framework*, you should think carefully before including your password in the log-on information, since it can easily be read by anyone who goes into the program.

Symphony's installation program includes three modem choices: Hayes and compatibles, PopCom and compatibles, and Internal PC*jr*. Since most modems today are Hayes-compatible, this restriction shouldn't matter much, but it may be an issue if you own some other modem.

TERMINAL CODES *Symphony*'s terminal emulation capability is both more and less comprehensive than *Framework*'s. *Symphony* lacks *Framework*'s simple menu choices for emulating popular terminals, but it includes a "custom translation table" feature. If you know the control codes for the terminal you want to emulate, you can use this feature to create your own terminal emulation. Unfortunately, this feature isn't explained very well in the manual.

Symphony's approach to sending and receiving data is the most cumbersome I've ever seen and is certainly more difficult to use than either *Framework*'s or *Enable*'s. File transfer is limited strictly to the Xmodem protocol. This limitation is fine if the computer on the other end of the phone line has an Xmodem option, but it means that you cannot take a text file and send it to an electronic mail system with a simple file-transfer command.

Instead, *Symphony* forces you to open a worksheet, mark off a range or block of text to send, and then send the marked block. This system can be useful if you want to send only part of a file, but it just makes extra work if you want to send the whole thing.

IT'S HARDER TO RECEIVE Receiving data is even clumsier. To capture text, you have to open a worksheet, then mark a range to capture the data. You must designate the upper-left-hand corner and lower-right-hand corner of the range, a process that is similar to marking a block of cells within a spreadsheet. The problem is that you either have to mark off the entire spreadsheet (8,192 rows) or know beforehand how large a block to mark. In receiving a text file, you first have to find out how many lines it's going to be, then mark off the lines, then ask for the other computer to start sending the file.

When the capture range is full, *Symphony* tells you by putting a message on the screen, but it does not send an XOFF character to tell the other computer to stop sending text. This approach is bad enough in transferring a file, where you can find out beforehand how long the file will be. It is disastrous in recording an on-line session, where you have no idea beforehand how much information you might want to save.

The only bright spot in this mess is that once you have captured the text you can edit it at will. Even better, it's in a spreadsheet if you need to manipulate it as such. If you know the column widths beforehand, you can capture spreadsheet data directly to the proper format. Alternatively, you can use *Symphony*'s parse feature to break the text data into the appropriate spreadsheet columns.

I also ran into a significant problem in trying to send text from my NEC PC-8201A to my AT. The NEC stores text as one long line, and *Symphony* doesn't know how to deal with this. Rather than wrapping the incoming text to the next line, *Symphony* tried putting the entire file on one line of the spreadsheet. To make matters worse, *Symphony* only allows 231 characters per line, so most of the file simply disapeared.

The *Symphony* communications module can be a useful tool, particularly when you are transferring files to another *Symphony*-equipped computer. (Lotus sells an optional synchronous communications module called *Symphony Link* that provides 3270 emulation when used with the IRMA board and will let you load mainframe data directly into your spreadsheet.) For general-purpose asynchronous communications, make sure you have some other communications program around as well. Even *PC-Talk III* will fill in most of *Symphony*'s functional gaps.

ENABLE

Enable's communications module is the least tightly integrated of the three packages, but as a communications program, it offers the most features.

As with *Framework* and *Symphony*, *Enable*'s autodial and autolog-on are handled through setup files that are created through a series of menu prompts. *Enable* allows a maximum of 64 setup files, enough to satisfy most needs. One sophisticated touch is a link between setup files, which can be useful for on-line systems that are available through more than one phone number. If the first number is busy, the program will automatically link to a second setup file and call the second number.

As with *Symphony*, *Enable*'s autodial and autolog-on are semiautomatic, stopping at times and waiting for you to hit a key. Again, you should think carefully before including your password in a setup file, since the log-on information is available to anyone who cares to look.

Modem choices are limited in *Enable*. The only autodial option is a Hayes modem or compatible, which should only be an issue if you already own some other modem. You can also set *Enable* for an acoustic coupler, which will work with any modem for manual dialing but won't autodial.

TERMINAL FACILITIES *Enable*'s terminal facility combines features of *Framework* and *Symphony*. As with *Framework*, a simple menu choice will

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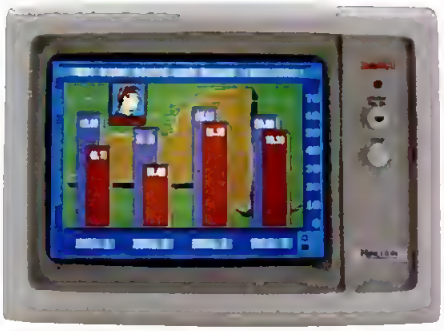


COMPARE:	Princeton SR-12P	IBM 5175
Dot Pitch (The lower, the better)	.26 mm	.31 mm
Sugg. Retail Price (The lower, the better too!)	$999	$1295
Warranty	1 Year	90 Days

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COMPARE:	Princeton HX-12E	IBM 5154
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Sugg. Retail Price	$785	$849
Tinted Black Matrix Tube	Yes	No
Warranty	1 Year	90 Days

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Princeton HX-12



IBM 5153

COMPARE:	Princeton HX-12	IBM 5153
Dot Pitch	.31 mm	.43 mm
Nonglare Screen	Yes	No
Warranty	1 Year	90 Days

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* Or equivalents.

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GRAPHIC SYSTEMS

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("Integrated Communications" continued)
set the program for DEC VT-100 or VT-52 emulation. As with *Symphony*, you can also create custom terminal-emulation tables if you know the appropriate control codes.

Like *Framework*, *Enable* offers a choice of approaches to capturing information. You can capture data in memory to save it later, or you can save data to disk. The first option lets you edit on-screen before saving data to disk.

At any time during a communications session, you can switch to word processing mode. The text on the screen stops scrolling, and you are free to edit it at will—even scrolling back to the beginning of the memory buffer. *Enable* will store any text that comes in while you're in word processing mode. When you go back to communications mode, data on the screen begins scrolling again.

FILE TRANSFER Unlike *Framework* or *Symphony*, *Enable* will not let you transfer columns of stock quotes or other text directly to a spreadsheet. However, it will let you transfer text to the database module and from there to spreadsheet columns.

Enable offers three choices for file transfer: ASCII, Xmodem, and a proprietary protocol for exchanging files with other *Enable*-equipped computers. While these three choices aren't as many as are in *Framework*, they are still enough to handle most situations.

One additional characteristic in *Enable*'s favor is ease of use for beginners and experienced users. All three of these programs use menu prompts and all three have extensive on-screen help. But *Enable*'s commands are the most obvious and intuitive, which makes them the easiest to learn and use. And the only important drawback to the *Enable* communications module is that it won't put columns of text in a spreadsheet format as easily as *Symphony* or *Framework*.—**M. David Stone**

M. David Stone is a frequent contributor to PC Magazine.

strangely when I tried to insert text in the middle of a paragraph. Word wrap broke down, and portions of the line dropped to the next line while other words were pushed off-screen to the right, never to be seen again. By block copying each paragraph and then deleting the original, I was able to get a usable file.

The format with the carriage return at the end of each line fared a little better, but I still had trouble inserting text. My final solution was to import the file, save it in *Enable*'s .WPF format, then call it back up again for editing. Not elegant, but it seemed to work.

The reformatting caused me some difficulty in one other area. *Enable* doesn't put any end-of-line marker on the spreadsheet data that you might copy as a table into a word processing document. If you try to delete characters in a line, the program tries to reformat that section as a paragraph and neatly demolishes your table. You must either add carriage returns to each line before you start to edit or turn reformatting off while you edit the table.

■ *Symphony* is not as strong as *Framework* and *Enable* in formatting, headers, footers, and other word processing features.

While the word processing functions worked reliably, I have strong opinions about the design philosophy of the program. It is written in such a way that it strongly favors the typeover or overstrike mode of word processing over the insert mode, although you can insert text anywhere you want and word wrap generally continues to work whether you are in insert or overstrike mode. This design philosophy manifests itself in several areas.

The most notable example is the Backspace key. In its default mode, this key behaves unlike the Backspace key in any other program I have ever encountered. It erases the character in the current cursor position (but does not remove the space) and moves the cursor one character to the left. If the cursor were under the *m* in the word *sample* when you pressed the key, the cursor would end up under the *a* in *sa ple*.

The Software Group must have heard that its Backspace key doesn't always work like the backspace in other programs, because it lets you choose from two optional configurations when you customize the program for your own use. One choice transforms the key into another Left Cursor key, which does no more than move the cursor. The third possibility moves the cursor one space to the left and erases that character, but still does not delete its space. In the case above, you'd end up with the cursor under the space in *s mple*.

Some other examples of *Enable*'s partiality to overwrite over insert mode: you cannot insert a Tab character. If you wish to move existing text, you must insert spaces. The carriage returns at the end of a line are ethereal creatures: you can't search for and replace them. You can create a return at the end of a line by placing the cursor anywhere on that line and pressing the Enter key. This means that you cannot split a line with the Enter key but must use Ctrl-Enter instead.

Some users, particularly novices, prefer the overstrike mode because it most closely resembles their experience with typewriter and paper. I found, though, that *Enable*'s word processor was not well matched to my writing style, and though I used it for my general work for a couple weeks, I could not get comfortable with it.

Enable was the winner in the mail-merge portion of my standard word processing task. Sample letter and database files were provided on-disk, making emulation a simple matter of copying and editing. On checking the manual for guidelines on setting up my own merge file, I discovered my favorite merge feature: conditional merge logic. The manual showed how to suppress a blank line in an address block if the merge field is empty, but I was able to use the same technique to have the merge letter print a salary raise at one of two different rates depending on the

employee's base salary amount in the merge file. With this feature you could develop one form letter containing dozens of different paragraphs, and only the appropriate ones would be printed for each individual recipient based on the logic statements you set up in the letter. *Enable* also makes it easy to make computations with field contents on the fly.

SYMPHONY

The weakest performer in the word processing area was *Symphony*. To begin with, it does not reformat consistently while you edit. Block functions apparently take care of themselves if you have turned on the autoreformatting function. For garden-variety deletions in the middle of a paragraph, you must invoke a justify command or use a function key to trigger the rearrangement of your prose.

As I typed away on a moderately large document, I found that *Symphony*'s word-wrap function went from noticeably but acceptably slow to incredibly slow: toward the end, it took almost 3 seconds before it was ready to show the next line. It was my own fault, but it brought home the difficulty of managing your work space when you must do everything on what is essentially one large spreadsheet.

What had happened was this: I had imported my 500-record database and set it up in a restricted range off to the right somewhere. I had started the word processing document as the first thing in a new worksheet and had forgotten to define its restricted range so that it would not affect other areas of the worksheet as I typed. Since I failed to limit its range, every time it wrapped a word, it inserted a new line all the way across the sheet, including right through the middle of the database. I was waiting for it to insert a line above some 450 records—no wonder it took so long. The moral of the story is that you must plan what you are going to put where before you start to fill in your spreadsheet. This is the kind of management that I would rather not have to worry about when I sit down to write or set up a quick database list.

I was able to import an ASCII text file without too much trouble, but it had to be in the carriage-return-for-each-line format. This requirement is a result of the same 240-character limit I mentioned in the database section. Once the file was in place, I could edit it and work with it just as if it had been created in *Symphony* in the first place.

One disconcerting event occurred while I was importing the text file. I had mastered restricted ranges by that point and had decided to put the document below the database rows in the same columns. When you import a file, *Symphony* writes over the contents of the cells where it lands, and since I knew that the area below the starting point was empty, I brought the file in. When I tried to edit it, I found that I was at the bottom of my restricted range for that window, and the document was mostly inaccessible until I modified the restricted range. The point of this explanation is that the restricted range provision only protects you from changes you make directly within a given cell. When you import a file, you run the risk of its leaving the restricted area and clobbering something below that you thought was safe.

I again ran head-on into *Symphony*'s complexity when I tried to work with the merge letters. I am sure that the program can do it, but I never managed to get all my report ranges and selection criteria defined in a way that *Symphony* deemed acceptable. There seems to be no end to the selections and manipulations you could achieve if you could fathom the mysteries of *Symphony* reports.

Symphony is not as strong as *Framework* and *Enable* in formatting, headers, footers, and other word processing features. To change fonts or printing attributes, you must embed control characters directly in the document. These do not print, yet they are considered by the program as it figures out its paragraph formatting. The resulting printout does not always properly format line lengths as a result. A related drawback is that *Symphony* cannot reformat text around merge fields, and so your merged documents will not be consistent if you embed a merge field in the text; the size of the merge field varies greatly.

OTHER FEATURES

INSTALLATION AND CONFIGURATION *Framework*, *Symphony*, and *Enable* can all be used on floppy disk systems. You will undoubtedly be more satisfied with a hard disk's performance, and given the size of some of the files you will want to save with some of these packages, you may need a hard disk's capacity. However, only *Enable* will make you do much disk swapping.

Enable is the only one of the three that is not copy protected, a significant plus in my rating scale. To set it up on a hard disk, you simply install all the files from the four disks into a subdirectory and start the program. You need to enter a lengthy command to start it and must decide before you start whether or not you are going to allocate memory so that you can use DOS in a window without leaving the program. This can all be handled by a one-line batch file; the manuals include examples to show how it is done.

Once you start the program, you can set up a profile that describes the printer you have, the type of screen, the colors you want, default formats, and how the Backspace key works, among other things. You can have multiple profiles so that different users can work with the same copy of the program, yet have it work just the way they want.

Symphony is copy-protected, and on a hard disk you start by copying all six disks to a subdirectory. You then run an installation program that prompts you for information about your computer system so that the appropriate drivers can be loaded for your display and printer. There is no way to eliminate the key disk; it must be present in drive A: every time you start *Symphony*, but you may remove it after the program has loaded.

Framework is also copy-protected, and all seven disks must be copied to the hard disk. Ashton-Tate provides two copies of the key disk, so that you have the security of a backup. It's possible to install the sys-

Integrated Software Packages: Summary of Features

Manufacturer Product	The Software Group Enable	Ashton-Tate Framework II	Lotus Development Corp. Symphony
List Price	$695	$695	$695
General			
Extended memory	No	Yes	Yes
Extended memory RAMdisk	No	Yes	No
Hard disk	Yes (database only)	Yes	No
Maximum windows open	8	Unlimited	Memory dependent; one field at a time
Database Management			
Maximum fields	254	32,000*	256; 32 per form window
Maximum records	65,000	32,000*	8,191
Link tables for lookup	Yes	Yes†	Yes
Multiple-field sort	Yes (8)	No	Yes
Indexes maintained	Yes (10 per database)	No	No
Case-sensitive searches	Yes (index only)	Yes	Yes
Field-entry edit masks	Yes	Yes†	Yes
Calculated field in reports	Yes	No	Yes
Spreadsheets			
Maximum spreadsheet size	Configurable from 126 × 511 to 4,095 × 15, or 65,000 cells	32,000 × 32,000*	8,192 rows × 256 columns
Average maximum no. of cells in 640K system	22,720	8,000	Not available
Link spreadsheets	No	Yes	Yes (through macro management)
Zero-width columns	Yes	Yes	Hide
Warning for circular references	Yes	Yes	Yes
Word Processing			
Maximum length of document	256K system: 100 pages	64,000 for single frame**	8,192 lines
Decimal tabs	Yes	No	No
Multiple-line headers and footers	Yes	Yes	No (yes with Top Labels)
No. of documents edited at once	8	Unlimited (based on memory)	1
Block column moves	Yes	No	Yes
Outlining	No	Yes	No††
Indexing	Yes	No	No††
Table of contents	Yes	Yes	No††
Footnotes	Yes	No	No

*Theoretical number; practical usage based on memory. †Only through programming. **With outliner function, maximum length is unlimited. ††Available as add-in program.

tem onto the hard disk so that you do not need the key disk to start the program, but be sure to read the manual's cautions on this subject before you do this. The process of copying the files and setting up the program for your computer system is handled by a thorough setup program. It is more involved than *Symphony*'s installation utility, but only because there are more choices to be made.

DOCUMENTATION As you might expect, these programs are not lightweights when it comes to documentation. *Framework*'s manuals weigh in at 7.75 pounds, *Enable*'s at 6.5, and a hefty *Symphony* set at 8.5. Together they made a perfect counterbalance to a Compaq portable outfitted with a hard disk.

■ *Symphony*'s documentation is not just the heaviest but also the classiest of the three.

Symphony's documentation is not just the heaviest but also the classiest of the three. A high-tech gray impact-resistant plastic case houses two large books, a pamphlet, and an impressive-looking disk vault. The how-to manual and reference manual add up to more than 1,000 pages of information contained in two paperback books. Bound manuals look nice and display a refreshing confidence on Lotus's part in the accuracy of their contents. I was surprised by the absence of a mass of errata sheets. Unfortunately, I was not as impressed by the content as I was by the image. The how-to manual is a ponderous collection of exercises that do not do the job of illustrating the different procedures. The reference manual does a better job of explaining concepts, but examples are still inadequate. The aftermarket for *Symphony*

books should continue unabated.

Framework's more conventional, spiral-bound manuals come in a soft vinyl box. In an interesting move, Ashton-Tate provided correction sheets prepunched for the bindings and included a little cardboard "comb" to make it easier to insert the new pages in the manuals. This method works well and should be imitated widely. Two small pamphlets cover getting started and quick reference material. The three larger books are *Learning Framework*, *Using Framework*, and *Advanced Topics*, which covers the FRED programming language and telecommunications. All in all, the 800 or so pages of text do a fair job of providing examples and clear explanations, despite some major failures. One is the almost total absence of information on importing files for databases.

Enable takes a different approach, providing a separate manual for each module. The five books are color-coded so that you can tell at a glance where you are. One covers the system in general, discussing such matters as window management and moving information back and forth between applications. The others cover word processing, database management, spreadsheets and graphics, and telecommunications. Two small pamphlets round out the documentation; one helps you get started and the other is a quick-reference guide. The manuals do a good job of providing conceptual explanations along with clear and useful examples. My only major complaint is that the chapters are broken into sliver-sized sections that are redundantly labeled; you may end up confused as to which Section C you are looking at. In addition, the errata sheets are bound into the front of the manuals where they are too easily overlooked.

LOOSE ENDS Each program has myriad features, many of which were not tested by my standard tasks. Here are a few of the interesting details hidden in each of the three packages.

The most useful of *Framework*'s many fascinating small features is the Undo command. Since the Del key will delete whatever is currently selected, you can quickly erase entire frames by accidentally hitting one key lower when you're aiming for the PgDn or Cursor Down key. On more than one occasion I wiped out whole frames full of notes or manuscript. The Undo brought them back every time. Without it, the universal function of the Del key would be too dangerous, but this safety valve makes the concept effective.

Framework's expanded memory function is highly touted. If you fill regular memory (and you will), you can set up the program to use expanded memory or an expanded memory RAMdisk to buffer the overflow from your desktop. If you don't have an expanded memory card, you can specify a hard disk as the site for this swapping, using it as a section of virtual memory. I was not able to try an expanded memory card, but I did try the buffering to disk. Don't do it. The toll in performance was too high a price to pay. For example, I had two large frames loaded on my desktop, which caused a significant amount of swapping to the disk. I then selected both and hit the Del key to get rid of them. More than 4 minutes later I regained control of the computer. For rare occasions where you simply must shoehorn in some more data, no matter how long it takes, this can be a handy facility, but it does not pay for day-to-day use.

■ *Enable* "speaks" *Volkswriter*, *EasyWriter*, *WordStar*, and *MultiMate*, in addition to its own format and straight ASCII.

For those of you who struggle to maintain control of your disks and files, *Symphony* will build a table of filenames on a worksheet. For the security minded, this is the only program that offers password protection to limit access to the information. A "front-end" menu program called Access, similar to the "Lotus" program that comes with *1-2-3*, is also included. In addition to *Symphony*, it lets you access the tutorial, PrintGraph, the "Install" program, and a translation utility that lets you read and write a variety of different formats, including *Symphony*, Versions 1.0 and 1.1, and *1-2-3*, Versions 1A and 2.

Enable is interesting in that it can link multiple databases so that you can have lookup tables to make data storage more efficient. The program's flexibility is also enhanced by its ability to read and write a variety of word processing file formats. It "speaks" *Volkswriter*, *EasyWriter*, *WordStar*, and *MultiMate*, in addition to its own format and straight ASCII. It also can build tables of contents and extract indexes from a document, which is especially useful for long reports.

WRAP-UP Neither *Enable* nor *Framework* nor *Symphony* is outstanding enough to tempt me away from the standalone tools I currently use daily. None offers consistent quality and power across the three basic applications: database, spreadsheet, and word processing.

Each is right for different users, however, and one may be just right for you. When you consider that you can purchase almost any of the three for less than the price of a dedicated word processor and a spreadsheet, the economics may make an integrated alternative more attractive.

Alfred Poor is a frequent contributor to PC Magazine.

PC MAGAZINE EDITOR'S CHOICE

To choose the best among three outstanding products, you must ask the question "Best for what?"

Framework II *clearly has the best word processing features*, Enable *offers the most useful database module, and* Symphony*'s spreadsheet runs circles around the competition. However, the package that is best at providing comprehensive functionality in spreadsheet, database, and word processing in a single package is* **Enable.** *If you are looking for one program to do it all, this is the one.*

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*✓Kids Stuff *(eges 3 to 8)*..... 29.

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*✓Reader Rabbit *(eges 5 to 7)* 26.
*✓Rocky's Boots *(ages 9 end up)*..... 32.

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*✓Pinball Construction Set 24.
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*✓PC Arcade 35

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*✓Bridge Perlor *(best Bridge simuletion)*... 49.

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*✓King's Quest II 33.

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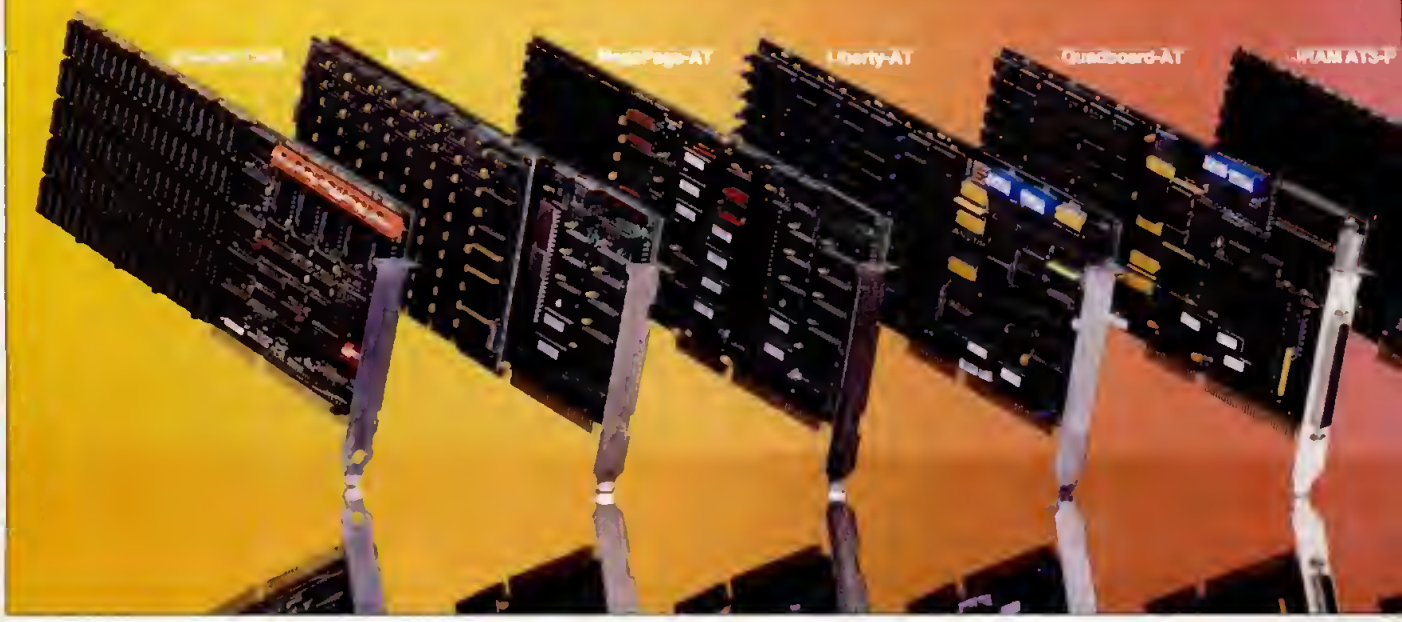
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MORE OPTIONS FOR ENLARGING THE DIMENSIONS OF MEMORY

Although DOS does not yet support extended memory, and although expanded memory is an interim solution at best, the market for boards that break the 640K-RAM barrier is flourishing. Here's how 11 new boards tested out.



Photograph Vittorio Sartor

Remember when 640K seemed like a lot of memory?

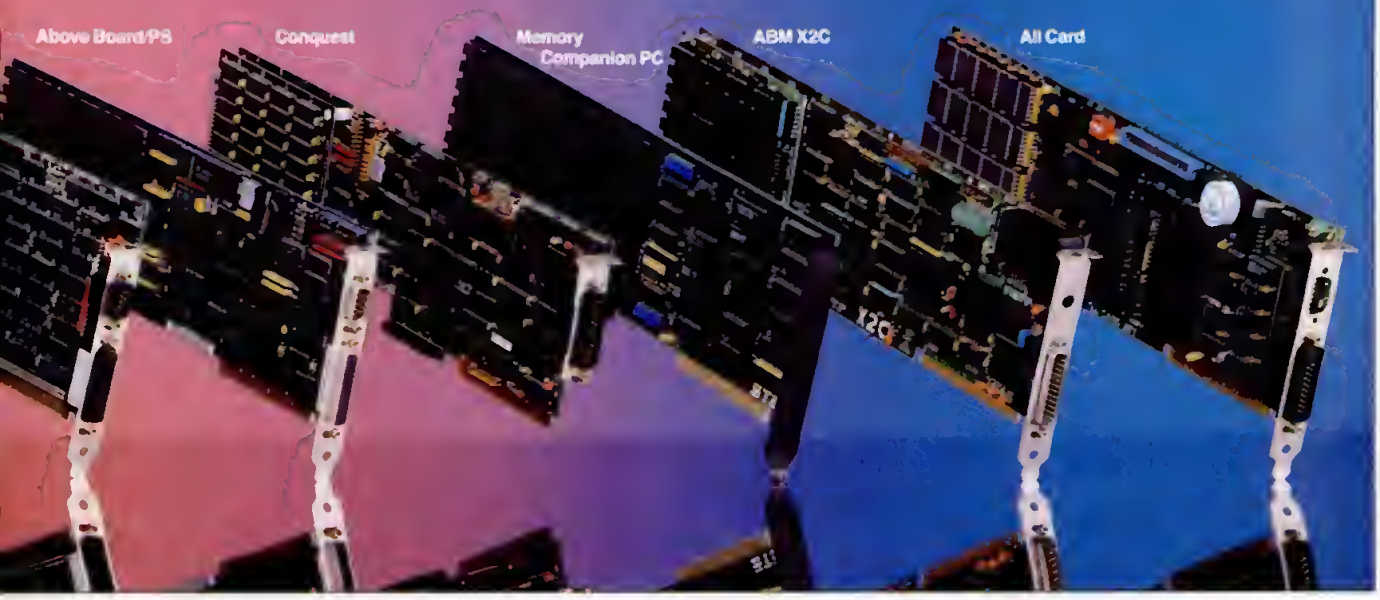
Your 640K bytes of random access memory is probably getting very crowded these days. Resident programs, RAMdisks, and print spoolers all stack up in memory before you even start loading applications. Now try running an alternative operating environment like *Microsoft Windows*, or an integrated program like *Framework*, and see how far you get.

In "Enlarging the Dimensions of Memory" (*PC Magazine*, Volume 5 Number 1), we took a detailed look at the two major methods used to go beyond the 640K memory barrier normally imposed by DOS, and we reviewed 12 memory boards that let you do it. Since that time, 11 more boards have arrived, and we've subjected them to the same set of PC Magazine Labs benchmark tests. If you happen to have memorized the first article, you know all about conventional, expanded, and extended memory. If not, here's a brief refresher course on the subject.

"Conventional memory" is what you probably have in your PC right now. Under the normal memory scheme of the PC, XT, AT, and compatibles, conventional memory occupies the first 640K of the total 1 megabyte addressable by those machines. Conventional memory is used for the operating system, resident programs, and applications. The rest of the total 1-megabyte address space is dedicated to other purposes: 128K is reserved for video adapters (and entirely used by the Enhanced Graphics Adapter), and 192K is reserved for ROMs (read-only memory), including the BIOS that runs your machine when you first power it up.

EXPANDED MEMORY One method of breaking the 640K-byte memory barrier is "expanded memory," a bank-switching scheme developed by Lotus Development Corporation and Intel Corp. Expanded memory can be used only by programs that are aware of it, but the number of programs that support it is rapidly growing (see sidebar, "Software: Expanded Memory Support Catches On"). After Microsoft Corp. promised that future DOS versions would support expanded memory, the standard became known as the Lotus/Intel/Microsoft expanded memory specification (EMS, also known as the LIM spec).

Expanded memory works by allowing up to 8 megabytes to be addressed within a single contiguous 64K window of memory. This window is addressed in the space that IBM has reserved for ROMs. Aside from the PC*jr*'s ROM cartridges, IBM has not used this area very much, so most PCs, XTs, and ATs can use expanded memory. Expanded memory is controlled by an expanded memory manager (EMM), a device driver included with expanded memory boards. By making calls to the EMM, an applications program can allocate expanded memory in page sizes of 16K bytes. The application then makes additional calls



to the EMM to switch these pages in and out of the 64K-byte window.

Programs must request memory from the EMM and are assigned a "handle" for future EMM requests. The programs must use this handle to get access to the memory. This memory management makes expanded memory versatile and reliable—although it is not by any means the ideal answer to the memory shortage. At best, it is an interim solution.

Although programs will normally use expanded memory for storing data, program code can also run in it. Resident programs and device drivers, as well as normal applications, can use expanded memory. For resident programs and device drivers, the expanded memory specification includes EMM calls that save the current page mapping and later restore it. You can run an expanded memory application that uses data stored in an expanded memory RAMdisk while printing from an expanded memory print buffer, and then pop up an expanded-memory resident program, with no fear (well, maybe just a little) that one program will wipe out the memory of another.

THE RIGHT WAY Those who feel that a bank-switched memory scheme is embarrassingly tacky probably have hopes of eventually using the full power of the 80286 microprocessor in their PC ATs. Under PC-DOS 3.*x*, the 80286 works in "real mode," which is compatible with the 8088 microprocessor in the PC and XT and which can address only the same old 1 megabyte of memory. When switched into "protected mode," however, the 80286 can address 16 megabytes of memory. The additional 15 megabytes is now known as "extended memory."

The problem is that PC-DOS cannot yet support the 80286 in protected mode. Moreover, when a protected-mode PC-DOS arrives, it may not be able to run many existing programs. If you'd like to know the reasons for this cruel injustice, see the sidebar, "Obstacles to a Grown-up Operating System." (Microsoft's Xenix works in protected mode, but it can't run DOS programs either.)

The only DOS program that can use extended memory at all is VDISK, the RAMdisk program included with PC-DOS 3.0 and 3.1. VDISK uses a BIOS call to transfer data between conventional and extended memory. This BIOS call switches into protected mode very briefly and very carefully just to make the transfer. It's not very pretty.

When a protected-mode DOS arrives, AT users will no longer talk about conventional memory and extended memory. It'll all be just memory—16 megabytes' worth. But does anybody want to bet that several years from now we'll be asking ourselves, "Remember when 16 megabytes seemed like a lot of memory?"

■ When a protected-mode PC-DOS arrives, it may not be able to run many existing programs.

BOARD TRENDS With the most recent batch of extended and expanded memory boards, some trends have become apparent. First, many extended memory boards for the PC AT also include expanded memory, using several techniques for dividing the board's chips between extended and expanded memory. These dual-personality boards definitely give PC AT users greater flexibility. However, if you generally run your PC AT under XENIX or are placing your bets that a protected-mode DOS is just around the corner, you may prefer a pure extended memory board, since expanded memory requires more on-board hardware. Some expanded-only memory boards for the PC and XT will fit in the AT and will work, but since these boards do not use the AT's 16-bit database, they operate very slowly. If you own an AT, don't cut corners: buy a board designed for it.

The second trend is for expanded memory boards to also be multifunction boards that offer a clock and parallel and serial ports. The 256K-bit chips on these boards can usually "backfill" conventional memory to bring it up to the 640K-byte maximum as well as provide a megabyte or so of expanded memory, making the once-ubiquitous 384K-byte multifunction board look like a museum piece.

One final important note: you cannot combine expanded memory boards from several different manufacturers. The expanded memory specification concerns only the means by which applications programs make calls to the expanded memory manager. The way that the expanded memory manager accesses the board to switch the banks in and out of memory will be different for each manufacturer's boards. If you have your sights set on eventually installing a full 8 megabytes of expanded memory, you must stick to one manufacturer.

Cheetah Card

The Cheetah Card is a 2.5-megabyte extended memory board that can backfill conventional memory. It does not support the LIM expanded memory specification.

The Cheetah Card's high speed may make you want to backfill conventional memory even more than you need to. The PC system board (and most memory expansion boards for the AT) inserts a wait state into memory accesses that slows down memory access but allows the use of slower memory chips. The Cheetah Card uses 100-nanosecond chips instead of the normal 120- or 150-nanosecond ones found in most memory expansion cards. It can run with no wait states at 6 MHz (the normal clock frequency in the AT shipped by IBM and used in PC Magazine Labs testing). The Cheetah Card documentation

PC MAGAZINE FACT FILE

Cheetah Card
Cheetah International Inc.
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Longview, TX 75602
(800) 243-3824 (outside Tex.)
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states that 70-nanosecond chips would be needed to have no wait states at 8 MHz (the normal clock frequency installed by AT users after the 90-day warranty has run out).

Programs running in the Cheetah Card memory run an average of 15 to 20 percent faster for a common mix of instructions. The extended memory speeds do not show as much of an improvement in our tests as conventional memory (only about 4 percent), mostly because of the overhead in switching into protected mode and back again.

If you already have 512K bytes on your system board, most of your programs will run in the system board memory and not take advantage of the higher-speed Cheetah Card. The documentation therefore recommends that you use only 256K of the memory on your AT system board. If you have a 512K machine, this requires a relatively painless jumper change.

Extended memory boards do not, in theory, need software, but the Cheetah Card comes with a disk including three programs. One of these, CSETUP, displays attractive large diagrams of the six sets of DIP switches on the board and helps you set them. You'll do better to rely on this program than to refer to the more obscure manual for configuring the board.

Also on the disk is FORCE, a remain-resident program that does nothing but take up space in memory to fill out the first 256K. And you thought you'd seen it all! This is not exactly the type of program you want to run if you're short for memory. The third program included with the Cheetah Card is CDISK, which can replace IBM's VDISK but is a tiny bit slower. (For consistency, the accompanying benchmark-test results show the timings with VDISK.)

PC AT speed freaks looking for an extra kick in their machines will like this board.

Eccell

If you read the words "switchless installation" on the box of Orchid Technology's Eccell board, you would naturally assume that the board has no DIP switches, and you would be right. Unfortunately, you still must configure the board, but instead of fooling with DIP switches you get to play around with jumper connectors. I see no real advantage to jumper connectors, and at least one disadvantage: you can't drop DIP switches on the floor.

The basic Eccell can hold a megabyte of memory divided between extended and expanded, and a large daughterboard adds 2 megabytes to that. With the daughterboard, the board's width will intrude into the next expansion slot. Orchid also sells an alternative daughterboard with low-profile but more expensive sockets (the alternative board costs $299 with no memory installed).

A setup program on the supplied disk takes you through the process of configuring the jumpers correctly. It also checks your current system memory and whether you have the proper jumper settings for backfilling. During each step, the jumpers that need setting blink on a monochrome display and appear highlighted on a color display. You don't lose any memory by backfilling: a 512K-byte AT system board and a 3-megabyte Eccell board give you 640K-bytes of conventional memory and 2,944K of extended memory.

I was a little puzzled that the board had no jumpers to specify the split between extended and expanded memory, but that proved to be the most innovative part of the

SOFTWARE: EXPANDED MEMORY SUPPORT CATCHES ON

PC Magazine's first article examining the Lotus/Intel/Microsoft expanded memory specification ("Enlarging the Dimensions of Memory," Volume 5 Number 1) listed only four software packages that supported expanded memory or were scheduled for expanded memory upgrades. These were Lotus Development Corp.'s *1-2-3*, Release 2, and *Symphony* 1.1, Sorcim's *SuperCalc*, and Ashton-Tate's *Framework*.

However, the simplicity of the expanded memory specification and its availability for use by device drivers and resident programs (as well as normal application programs) made it obvious that these were just the first four of many. Sure enough, expanded memory is catching on.

Intel has been keeping track of companies that have announced support of expanded memory in their products.

Here's a list of programs currently shipping:

Ashton-Tate	*Framework II*	**Microsoft**	*Microsoft Windows*
Gryphon Microproducts	*dB/RA 3*	**Personal Computer Support Group**	*Lightning*
Javelin Software	*Javelin*	**Quarterdeck**	*DESQview*
Living Videotext	*Ready!*, Version 1.0	**Sorcim/IUS**	*SuperCalc 3*, Version 2.1
Living Videotext	*ThinkTank*, Version 2.1	**Turner Hall Publications**	*Note-It*
Lotus Development	*1-2-3*, Release 2	**Borland**	*Reflex*
Lotus Development	*Symphony*, Version 1.1		
MaxaMedia Corp	*Maxam Plus*		

The following software packages were being prepared for shipping at the time of this review:

Awesome Software	*Multiple Choice*	**Polytron Corp.**	*PolyWindows Desk Plus*
Information Builders	*PC/Focus*	**SSI Software**	*WordPerfect Library*
Innovative Software	*Smart* series	**Softlogic Solutions**	*DoubleDOS*
Knowledgeware	*Information Engineering Workbench*	**Softlogic Solutions**	*Software Carousel*
Media Cybernetics	*Dr. Halo Extended*	**T&W Systems**	*VersaCAD*

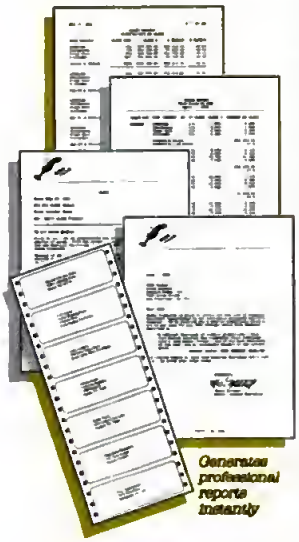
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Reflex includes the best Report Generator for Lotus 1-2-3

Reflex includes the Report Generator that 1-2-3 should have included—but didn't. With Reflex, you can generate reports, graphs, charts and diagrams *from* your 1-2-3 worksheets that are impossible to generate *with* 1-2-3.

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Reflex makes graphic leaps far beyond 1-2-3. With Reflex, when you look, you see.

Reflex gives you five new and different views of what's hidden in your 1-2-3 worksheets

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The commands for all five Views are consistent—so you're not stuck learning five different ways to get something done. And because Reflex uses advanced windowing techniques, you can see several views on the screen at the same time—without having to switch back and forth. You get the picture, and the pictures, all at once.

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Peter Norton, PC Week

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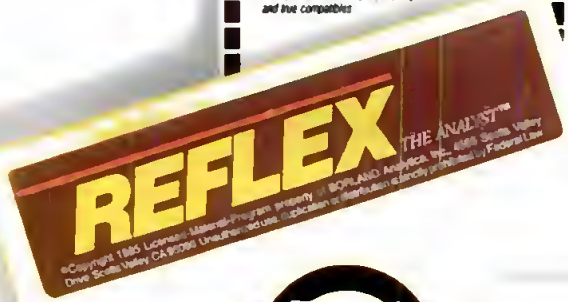
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CIRCLE 147 ON READER SERVICE CARD

Orchid board and the real meaning of "switchless installation."

If all you want is extended memory, you need only run the AT's Setup program. A second setup program on the supplied diskette guides you through the software installation for expanded memory and edits your CONFIG.SYS and AUTOEXEC.BAT files. It also sets the correct values of memory in the AT's CMOS RAM so you don't have to go through the AT Setup program. This installation program has one little problem: it puts the CONFIG.SYS file in the current directory of the drive you specify, C:, and not in the root directory where it belongs. The folks at Orchid are aware of this problem and recommend running the installation from the root directory.

The software handles the split between extended and expanded memory. The first line of the CONFIG.SYS must have an EMSHDR.SYS device driver to specify what part of total board memory is for expanded memory. This program takes the extended memory size saved by the Setup program in CMOS RAM and adjusts it downward. Presto: the BIOS now thinks it has less extended memory and the rest can be used for expanded memory. This technique bothered me at first, but I was gradually won over by the ease of changing the amounts of extended and expanded memory by simply changing one line in the CONFIG.SYS file.

Another Eccell extra is its error-correction scheme. Instead of a single parity bit per byte, the Eccell scheme uses 3 extra bits per byte, which allows the board to correct spurious 1-bit errors and even keep working if a whole chip fails. (For more information on error corrections, see "Error Correction Instead of Just Detection," in this issue's cover story.)

The Eccell is an excellent board for people who need varying combinations of extended and expanded memory—and if you hate setting DIP switches, you have another reason to choose it. A good manual complements this attractive product.

MegaPage-AT

Anybody who sees a lot of computer products knows that sometimes the same hardware is sold by different companies under different names. There's nothing wrong with this practice, but it is something to be aware of.

MicroWay's MegaPage-AT board is the same as Orchid's Eccell board and even has the same device drivers and RAMdisks. It handles the split between extended and expanded memory by software, which will please anyone who needs to use different combinations of extended and expanded memory.

Does MicroWay's MegaPage-AT offer advantages that Orchid's Eccell lacks? Definitely. MicroWay is well versed in high-speed processing with accelerator cards and number-crunching using the 8087 coprocessor. It needs to know what type of machine you are running before selling you a board, and it will help you select the right one for your configuration. It will even populate and test out the board for you.

Are there any disadvantages? Perhaps. The MegaPage-AT board does not come with Orchid's setup programs, assuming you could do the job better with an editor. And although while reviewing I was working with a first draft of the MicroWay manual, it has a long way to go before it approaches the lucidity and comprehensiveness of Eccell's.

Liberty-AT

Quadram's Liberty-AT board gives you 2 megabytes of on-board memory that can be configured as either extended memory or expanded memory. You can also add up to two 1-megabyte Quadram Memory Expansion boards to the Liberty-AT. We did not have the opportunity to see the Memory Expansion option, which lists at $285 for 0K and $915 for 1 megabyte.

You can use the board to backfill conventional memory, but if the board is installed with 256K-bit chips, you lose memory because the Liberty-AT backfills in increments of 512K bytes. For instance, if you backfill 128K bytes to bring your AT's conventional memory from 512K bytes to 640K, you'll lose an additional 384K. If you are backfilling 128K, you can save a little money if you use 64K-bit chips in the first two banks, which will be used for backfilling, and 256K-bit chips beyond that. At any rate, any backfilling reduces the basic Liberty-AT board to 1.5 megabytes. You can specify the starting address of extended memory on the board in 512K-byte increments up to 13.5 megabytes.

Quadram is in the process of revising the manual for the Liberty-AT. The version of the documentation I saw is very soothing in tone but leaves out some essential information. For instance, it has no mention of the PC-AT Setup program that is necessary to prevent the BIOS from signaling errors to you during boot-up. (Under the configuration I described above, backfilling from 512K to 640K bytes, the correct Setup values are 640K for conventional memory and 1,536K for extended memory.)

If you just install the board and specify the correct values to the Setup program,

PC MAGAZINE FACT FILE

Eccell
Orchid Technology
47790 Westinghouse Dr.
Freemont, CA 94539
(415) 490-8586
List Price: 0K, $595; 0K daughterboard, $165
Requires: PC AT or compatible.
Type: Extended and expanded memory
In Short: The Eccell board's memory can be split by its software between extended and expanded memory, a convenient way to use both without resetting DIP switches.

CIRCLE 684 ON READER SERVICE CARD

PC MAGAZINE FACT FILE

MegaPage-AT
MicroWay
P.O. Box 79
Kingston, MA 02364
(617) 746-7341
List Price: 0K, $595; 0K daughterboard, $165
Type: Extended and expanded memory
Requires: PC AT or compatible.
In Short: Although the MegaPage-AT is the same board as Orchid's Eccell, it does not include the Orchid setup programs and documentation. The advantage of buying from MicroWay is outstanding personal service.

CIRCLE 683 ON READER SERVICE CARD

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You could be running Lotus 1-2-3,® MultiMate,™ MicroStar,™ Reflex,™ SideKick,® WordStar,® or WhatEver;* it doesn't matter which one, because as you write, Turbo Lightning watches how you spell every word, and is ready to alert you to any mistakes.

So let's say your neighbor, who already has 23 unmatched sets of plastic flamingos on his front lawn, a broken boat trailer, and a mattress, has now brought back a coyote from a hunting trip. It howls all night, and you're writing a letter involving the word IDIOT, but you accidentally typed IDOIT. What happens then? You immediately *hear* a beep, so you know something's up. You instantly *see* a window that doesn't list IDOIT, but it does list IDIOT and its sound-alike words, so your screen window looks like this:

```
A  IDIOT
B  IDIOTS
C  IDIOM
O  IDIOTIC
E  INDICT
F  IDIOMS
G  ADD WORD TO AUXILIARY DICTIONARY
```

So you move your cursor to A, which is the correct spelling for IDIOT, hit return, and the spelling mistake is instantly fixed.

Turbo Lightning also gives you instant synonyms

IDIOT was the word you planned to use in your note next door, but is it the best word? And should you use that particular word since your neighbor fools around with his guns when he's full of whisky (which is every night), and besides that, he's 6'10", a black belt, and your cousin?

Because you have Turbo Lightning's Random House Thesaurus at your fingertips, you can look at the *synonyms* for IDIOT. Type in IDIOT and what you see is:

```
· NOUN ·
A CRETIN
B MORON
C HALF-WIT
D BLOCKHEAD
E JERK
F NITWIT
G FOOL
```

Any one of which expresses your opinion of your cousin's mental stature. So write the letter, but *don't mail it!*

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And for only $149.95, you can get *both* Turbo Lightning and the Word Wizard, which is so intriguing, you'll probably be up half the night. And if that happens, sneak next door around 4A.M., unchain the coyote, and let it run away!

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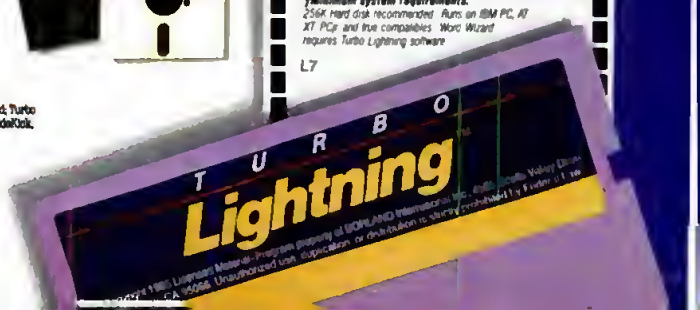
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†Minimum system requirements:
256K RAM, hard disk recommended. Runs on IBM PC, AT, XT, PCjr, and true compatibles. Word Wizard requires Turbo Lightning software.

L7



the Liberty-AT board works as extended memory. You can use either the PC-DOS VDISK program or Quadram's own extended memory RAMdisk (part of the software included with the Liberty-AT).

If you put the Quadram expanded memory manager program (called QUADRAM.SYS) in your CONFIG.SYS file, the entire memory on the board, less the amount lost by backfilling, is allocated for expanded memory. However, you cannot install more than one Liberty-AT board in your system for expanded memory use. Here's why: an expanded memory manager switches banks of 16K bytes in and out of the 64K-byte window through I/O ports. Each expanded memory board you install in your system must use a different I/O port for this switching, and the expanded memory manager must be told what these I/O ports are by a parameter in the CONFIG.SYS file. For its Above Board, Intel established seven I/O addresses to access expanded memory.

The Liberty-AT board, however, is hard-wired for address 258h. You can't install more Liberty-ATs for expanded memory because they would conflict with the I/O address. You also cannot supplement expanded memory with other manufacturers' boards because the expanded memory manager interface to the boards is not standardized. You can, however, add Quadram's Quadboard-AT to increase expanded memory beyond the 4 megabytes the Liberty-AT and the two Memory Expansion boards you can add to it allow.

PC MAGAZINE FACT FILE

Liberty-AT
Quadram
1 Quad Way
Norcross, GA 30093
(404) 923-6666
List Price: 0K, $475; 128K, $595; 256K, $695, 512K; $795; 1 megabyte, $1,095; 2 megabytes, $1,495
Requires: PC AT or compatible.
Type: Extended and expanded memory
In Short: The Liberty-AT's hardware design prevents you from installing more than one board for expanded memory, but you can put 4 megabytes of memory on the board.

CIRCLE 682 ON READER SERVICE CARD

Quadboard-AT

Quadram's Quadboard-AT board is much like Quadram's Liberty-AT board, except that it has 512K bytes less memory on the main board. It adds a parallel and two serial ports and can take the same two 1-megabyte Memory Expansion Boards as the Liberty-AT, bringing the grand total to 3.5 megabytes.

The backbrace of the Quadboard-AT has a 62-pin connector that attaches by cable to a small box containing a parallel and two 9-pin serial connectors. The box hooks onto the back of your AT.

The Quadboard-AT's memory can be used for either extended memory or expanded memory, but not both. The presence of the QUADRAM.SYS expanded memory manager in your CONFIG.SYS file makes the difference.

As Quadram's Liberty-AT board is hard-wired for I/O address 258h, making it impossible to install additional Liberty-AT boards for use as expanded memory, the Quadboard-AT can be selected for I/O address 258h or 268h. If you want to use Quadram products for expanded memory on the AT, you would set the Quadboard-AT for 268h and supplement that with a Liberty-AT board. Without any backfilling, you can get 4 megabytes with the Liberty-AT board (with two Memory Expansion options) and 3½ megabytes on the Quadboard-AT (also with two Memory Expansion options) for a total of 7½ megabytes; just 512K bytes short of the 8-megabyte expanded memory maximum.

The Liberty-AT and Quadboard-AT share a problem. Normally, a board that can be used for both extended and expanded memory requires a DIP switch setting to specify the split. Another approach (used in Orchid's Eccell and MicroWay's MegaPage-AT) allocates part of the board for expanded memory through software and then alters the amount of extended memory that the AT BIOS thinks it has.

With the Quadram expanded memory manager installed, all the memory on the boards is used for expanded memory. However, the AT BIOS still believes that all the memory is extended memory. If you install both an expanded memory RAMdisk and an extended memory RAMdisk (either the PC-DOS VDISK or Quadram's own), the RAMdisks will use the same memory space, more or less. If you copy files into one of these RAMdisks, you're overwriting the other and trashing its contents. The contents of expanded memory (normally protected by the memory management of the expanded memory manager) can be corrupted by access through the BIOS Interrupt 15h. I consider this a serious design flaw. Quadram's technical people consider my use of extended and expanded memory RAMdisks to be an improper use of the Liberty-AT and Quadboard-AT boards. I'll let you decide who is right.

PC MAGAZINE FACT FILE

Quadboard-AT
Quadram
1 Quad Way
Norcross, GA 30093
(404) 923-6666
List Price: 128K, $595; 512K, $995; 1 megabyte, $1,525; 1.5 megabytes, $2,195
Requires: PC AT or compatible.
Type: Extended and expanded memory
In Short: The Quadboard-AT with Memory Expansion options can go up to 3.5 megabytes and includes a parallel and serial port, but some software problems reduce the integrity of its expanded memory.

CIRCLE 681 ON READER SERVICE CARD

JRAM AT3-P

Tall Tree Systems was bank-switching memory on the PC before most people saw a need for it. Its latest product, the JRAM AT3-P, supports extended and LIM-type expanded memory as well as Tall Tree's own bank-switching scheme.

The JRAM AT3-P holds 2 megabytes' worth of 256K-bit chips. Its backbrace includes a parallel and a serial port, but to use these you need an extra $140 module that plugs into the board. A "JLaser Interface" module for laser printers with Canon engines is also available for $400.

The documentation is oriented toward users experienced with installing hardware and setting up CONFIG.SYS and AUTOEXEC.BAT files. Unlike many of the other boards, the JRAM AT3-P's software does not include an easy installation pro-

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gram. However, the manual has loads of technical information about controlling the regular JRAM AT3-P bank-switching mode and using expanded memory. It is the first manual I've seen that includes documentation (8 pages worth) on the LIM EMS. (The complete 70-page formal specification is available from Intel, but that company doesn't even include this information with its own Above Boards.) The disk also includes assembly language source code for the primary system files, another thing nobody else has done.

To use expanded memory, you need to have two files in your CONFIG.SYS: JBOOT (which is needed for anything beyond using the board as AT-extended memory) and JPAGER (which is the expanded memory manager). JBOOT also allows you to increase the size of the DOS-addressable RAM from 640K bytes to 704K, but of course this arrangement is not compatible with the graphics modes of the IBM Enhanced Graphics Adapter or the Tecmar graphics card.

The RAMdisk and print-spooler included with the JRAM AT3-P do not work through the expanded memory manager, so the PC Magazine Labs benchmark-test results do not show RAMdisk timings.

Since the JRAM AT3-P uses Tall Tree's own bank-switching techniques for implementing expanded memory, I expected it to be slower than the boards specifically designed for expanded memory. In the random-access test of expanded memory, however, the JRAM AT3-P proved to be significantly faster than the other expanded memory boards for the AT included here.

If you need to do bank-switching beyond the capabilities of the LIM expanded memory specification, Tall Tree's JRAM AT3-P boards are a solid alternative (while EMS lets you switch 16K pages, the JRAM AT3-P can switch 128K). But if you're not technically inclined, this board may be more than you want to bother with.

Above Board/PS

The Above Board/PS, the third of Intel's expanded memory Above Boards, holds 1.5 megabytes (512K bytes less memory than the Above Board/PC) and adds parallel and serial ports and a clock with battery backup. The serial port uses the newer 9-pin connector used on the IBM AT. A converter cable is not included, but such cables are readily available.

In reviewing the two previous Above Boards, we knocked Intel for failing to provide technical information on installing the expanded memory drivers and requiring everybody to use its installation program. I am pleased to report that all Above Boards now include a small *Hacker's Guide*, a masterpiece of concise writing crammed solid with all the information you'll need. If you know how to use a text editor (such as EDLIN), and have experience with AUTOEXEC.BAT and CONFIG.SYS files, do yourself a favor and go straight to the *Hacker's Guide*. You'll have your Above Board up and running in a few minutes.

However, if you find the *Hacker's Guide* impenetrable, you can use Intel's installation program. Version 2 of the program, included with this board, is significantly improved over the version we commented on in the earlier reviews.

For instance, Version 1 of the installation program put the expanded memory manager and RAMdisk DEVICE statements at the top of your CONFIG.SYS. If you had other disk device drivers in your CONFIG.SYS (such as for Bernoulli Boxes), the drive letters for these later devices were changed. Now Intel has correctly put the expanded memory manager at the top of the CONFIG.SYS and the RAMdisks at the bottom. However, the installation program is still dreadfully slow, requiring 63 disk transfers between floppy drives A: and B: to copy three small files and edit CONFIG.SYS and AUTOEXEC.BAT.

The Intel boards are well made, the documentation is very good, and (since Intel coauthored the EMS standard) the software is definitive. For people who won't settle for imitations or compatibles, this is the board to buy.

■ Since Intel coauthored the EMS standard, its software is definitive.

Conquest

Orchid Technology's Conquest is a multifunction board that gives you a megabyte of expanded memory on the main board and another megabyte on a daughterboard, as well as serial and parallel ports.

The serial port on the Conquest uses the 25-pin connector common on the PC and XT rather than the 9-pin connector adopted by IBM for the PC AT serial port. The 25-pin serial connector's location on the backbrace of the board prohibits the parallel connector from being mounted there also;

PC MAGAZINE FACT FILE

JRAM AT3-P
Tall Tree Systems
1120 San Antonio Rd.
Palo Alto, CA 94303
(415) 964-1980
List Price: 0K, $349; 2 Mbytes, $669
Requires: PC AT or compatible.
Type: Extended and expanded memory
In Short: Extensive technical documentation and Tall Tree's own bank-switching scheme, along with both expanded and extended memory, make this board an intriguing alternative. But these extras add up to more than the average user will need or want.
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Above Board/PS
Intel Corp.
Mailstop TOC-03
5200 NE Elam Young Pkwy.
Hillsboro, OR 97124
(800) 538-3373 (outside Ore.)
(503) 629-7354 (in Ore.)
List Price: 64K, $445; 256K, $545; 1.5 Mbytes, $1,195
Requires: PC, XT, or compatible.
Type: Expanded memory
In Short: This multifunction expanded memory board is an ideal memory board for new PCs and XTs and can also replace existing 384K multifunction boards in older machines.
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The Cheetah Card owes its speed to its 100-nanosecond memory chips. The Eccell board was consistently slowest, but its features may outweigh its lack of speed. The JRAM's good showing surprised us: We expected its unique bank-switching technique to slow it down. The results for the rest of the expanded/extended memory boards were very similar, but the expanded-memory-only boards ran at a wide range of speeds. Another board with good features, the Conquest, had disappointing results, while the Above Board/PS's speeds were as solid and consistent as the product itself. The Memory Companion PC may owe its inconsistent results to a confusing installation process.

instead, it is connected by a cable that you can loop between the cover and back of your machine.

Like Eccell's, the Conquest's installation software includes two setup programs, one that you run before installation and another one for after installation.

The first setup program checks out the memory, parallel, and serial ports already installed in your machine, asks some questions, and then instructs you how to set the jumpers on the board by using blinking or highlighted diagrams on the display. (If you can't see the highlighting on a color/graphics display, adjust your contrast.) If you don't like DIP switches, you're in luck: the board doesn't have them. But you will probably find that you don't care much for jumper connectors either.

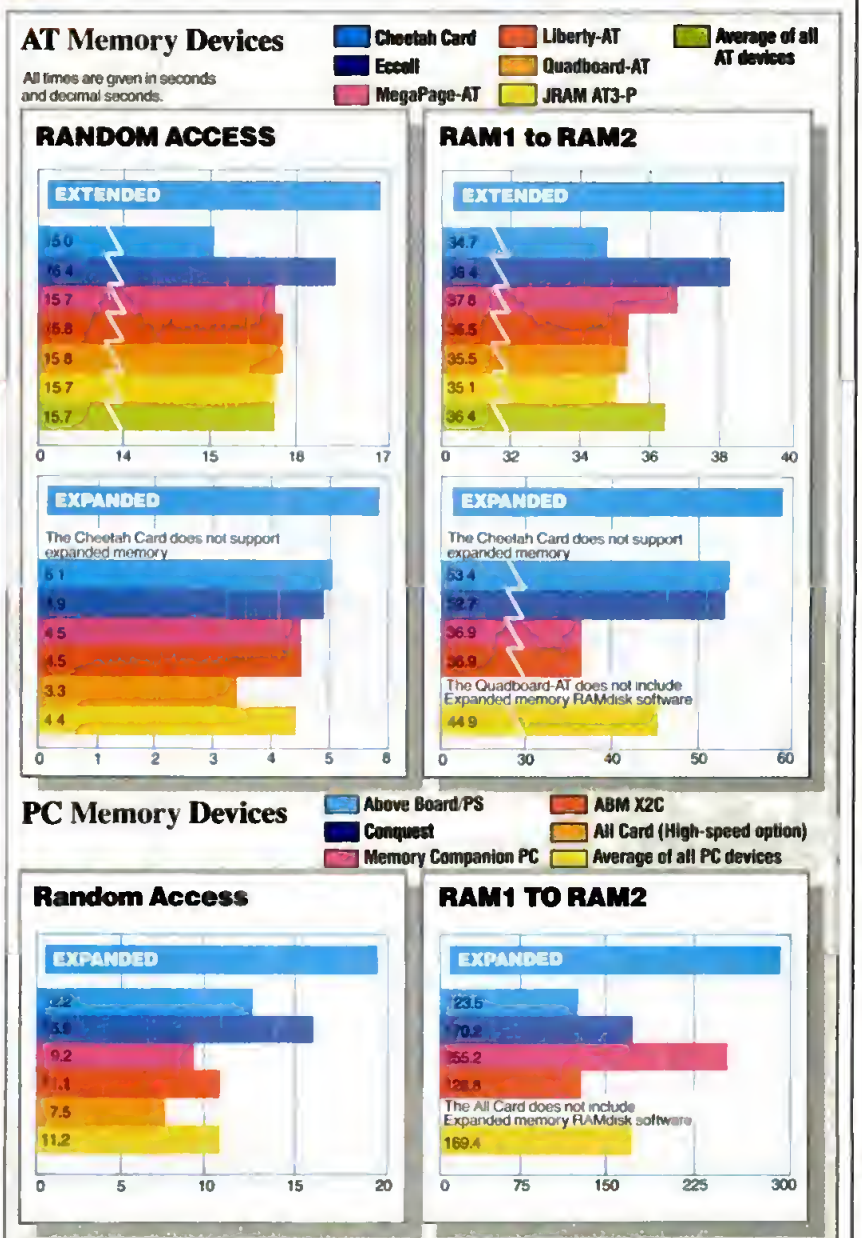
The second installation program edits your CONFIG.SYS and AUTOEXEC.BAT files to insert the proper lines for the expanded memory manager, RAMdisk drivers, and print spooler. You may find it

PC MAGAZINE FACT FILE

Conquest
Orchid Technology
47790 Westinghouse Dr.
Fremont, CA 94539
(415) 490-8586
List Price: 0K, $395
Requires: PC, XT, or compatible.
Type: Expanded memory
In Short: Helpful, but not perfect, installation programs let you get this 2-megabyte multifunction board up and running quickly.

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PC LABS BENCHMARK TESTS



The **Random Access Extended Memory** benchmark test allocates 256K bytes of extended memory and treats it as a series of 64-byte records. Then 16,384 random records are read into and written from extended memory. The results show the average of the read and write times.

The **Random Access Expanded Memory** benchmark test allocates 256K bytes of Lotus/Intel/Microsoft expanded memory and treats it as a series of 64-byte records. Then 16,384 random records are read into and written from expanded memory. The test measures the efficiency of the Expanded Memory Manager in switching banks of memory. The results show the average of the read and write times.

The **RAM1 to RAM2 Extended Memory** benchmark test uses IBM's VDISK program supplied with DOS 3.1 to install two RAMdisks in extended memory. It then creates a 128K-byte file and copies it in 128-byte blocks from one RAMdisk to the other, ten times.

The **RAM1 to RAM2 Expanded Memory** benchmark test uses RAMdisk software supplied with the expanded memory board to install two RAMdisks in expanded memory. It then creats a 128K-byte file and copies it in 128-byte blocks from one RAMdisk to the other, ten times. The test measures the efficiency of the Expanded Memory Manager and RAMdisk Software.

OBSTACLES TO A GROWN-UP OPERATING SYSTEM

A version of DOS that supports both 80286 protected mode and existing DOS applications will be difficult, if not impossible, to develop. Microsoft may have to sacrifice backward compatibility, shifting the problem to software makers.

After working on a PC AT for just a few minutes, you can tell that its Intel 80286 microprocessor is faster than the 8088 found in the PC and XT. However, the 80286 offers more than just speed. Normally the 80286 works in "real mode," which is compatible with the 8088 microprocessor. But when switched into what Intel calls "protected mode," the 80286 can directly access 16 megabytes of memory—dubbed "extended memory"—instead of the meager 1 megabyte possible with the 8088. You can install extended memory in your PC AT a few megabytes at a time by buying extended memory boards.

It's sad, but although the PC AT has been available since fall 1984, a version of DOS that supports 80286 protected mode is still (as of this writing) only the subject of rumors and speculation. Industry observers speculate that Microsoft is hard at work on a protected-mode DOS and might release it any time within the next 2 or 3 years. Right now, the only DOS program that can take advantage of extended memory is VDISK, a RAM-disk included with PC-DOS 3.0 and 3.1.

The problems delaying a protected mode DOS are not related to bugs in the 80286 chip or protected mode operation itself. Microsoft has already solved these problems with its UNIX lookalike operating system, XENIX. The problem is getting a protected mode DOS to run existing PC programs.

A LITTLE BACKGROUND The amount of memory addressable by a microprocessor is dependent on the number of bits used for the address. The simple formula is:

$$m = 2^b$$

where m is the amount of memory and b is the number of bits. A 16-bit address can access 2^{16} or 65,536 bytes (64K). The megabyte of memory addressable by the 8088 in the PC and XT (and the 80286 in real mode) requires 20 bits. The 16 megabytes addressable by the 80286 in protected mode require 24 bits.

The first Intel microprocessor chip to be widely used in small computers was the 8080, which generates a 16-bit address and can address 64K of memory. Since internal registers in the 8080 are 8 bits and 16 bits wide, it is easy for the 8080 to calculate a 16-bit address from a 16-bit register.

■ Segmented memory proves to be a clean way to give 8088 programs access to more memory than would be possible using 16-bit registers.

Intel's 8088 and 8086 microprocessors also internally use 8-bit and 16-bit registers. (The 8088 is an 8-bit data bus version of Intel's 8086. When I speak of the 8088 from now on, I'll be referring to both the 8086 and 8088.) Yet these chips can address 1 megabyte of memory, which requires 20 bits. Intel managed to maintain some upward compatibility with the 8080 by using a "segmented memory" scheme. The 20-bit absolute address that accesses the 1 megabyte of memory is actually generated from two 16-bit registers called a segment register and an offset register. The 8088 microprocessor internally makes the calculation, which is:

absolute address = (16 × segment) + offset

This formula is also used in the 80286's real mode.

The 8088 and 80286 actually have four segment registers: code, data, the stack, and an extra. The segment registers can range from 0 and 65535 (FFFF in hexadecimal). So can the offset registers. By keeping the segment registers constant, programs can access 64K bytes of memory beginning at each of the segment addresses just by manipulating the offset registers.

A single absolute address can be represented by many different combinations of segment and offset addresses. For instance, if you look at the ROM BIOS listing for any member of the PC family, you'll find that the current video mode is stored at address 0040:0049. The segment address (in hexadecimal) is 40. The offset address is 49. The absolute address is 449. Programs can also access this byte with the address 0000:0449, and some do. You can also represent this address as 0044:0009.

Segmented memory (although confusing at first) proves to be a nice clean way to give 8088 (and 80286 real mode) programs access to more memory than would normally be possible using 16-bit registers.

THE 80286 DIFFERENCE In 80286 protected mode, programs use the same segment and offset registers as in 80286 real mode. Yet when the 80286 is in protected mode, it can address 16 times as much memory. Normally, this would require 4 more address bits.

The trick is that the segment address in 80286 protected mode is no longer a physical address. Instead, it is a "virtual address" and more specifically, a lookup value into a "descriptor table" stored in memory. This table provides the physical "base" address, which is 24 bits long. The 80286 adds the offset address to this base address.

The formula for an absolute address in 80286 protected mode is:

absolute address = base [segment] + offset

(I've indicated with brackets that the base address comes from a lookup table indexed by the segment address. This is a common array notation.) This process is transparent to an application program. The descriptor table is maintained by the operating system, and the calculation of the absolute address is done within the 80286.

As complex as this may seem, I'm actually simplifying much of it: only the high 14 bits of the segment register are used for the lookup value, and the least significant bit of these 14 bits marks a segment as belonging to a specific task or accessible globally. But let's ignore these details.

Thus, the 80286 protected mode is very compatible with the 80286 real mode, and hence, with the 8088. Programs use the same 16-bit segment registers and the same 16-bit offset registers and have access to 16 megabytes of memory instead of just 1 megabyte. But "very compatible" just doesn't make it with real-life PC programs.

The two formulas above show how the 80286 microprocessor calculates an address in real mode and protected mode. The problem is that programmers have known about the first formula for years and have used it liberally to do segment arithmetic.

For instance, suppose a word processing program needs 64K of memory to load in a document. It can do this by taking the segment and offset address of the first free byte in memory following the program, dividing the offset by 16, and adding it to the segment. This calculation yields a new segment address at the end of the program that now begins an unused 64K segment.

In 80286 protected mode, this formula doesn't work. In protected mode, the physical address corresponding to this calculated segment must be stored in the descriptor table maintained by the operating system. It may actually be physically located below the program doing the calculation, and it may belong to another program. It's quite possible this segment address does not have a descriptor table entry at all and thus is simply invalid.

■ The 80286 protected mode is very compatible with the 8088, but "very compatible" just doesn't make it with real-life PC programs.

In the 8088 and 80286 real mode, a segment is defined as 64K bytes beginning at the segment address. This definition allows segments to overlap and for absolute addresses to be defined as many combinations of segment and offset addresses. Two segment addresses that differ by 1 are physically 16 bytes apart. In 80286 protected mode, each segment is distinct. The segment addresses bear no relation to where the segments are really located in memory and how big they are. Each segment in protected mode has a defined length, ranging from 1 byte to 65,535 bytes, which is also stored in the descriptor table. A program may not address memory beyond this defined length of the segment.

Many large programs that run under DOS now simply grab all the available memory they need (and even some they do not need) and calculate segment addresses for it. On the 80286, this memory must be requested from the operating system. The operating system must then set up the descriptor table for the 80286 that tells the chip the size of each allocated segment. Only then can a program use this memory.

CODE VS. DATA SEGMENTS Protected mode is called "protected" for a reason: the 80286 microprocessor contains a support for a multitasking environment, and part of this support is that the microprocessor itself protects the memory of one task from being destroyed by another task. If one program crashes, it doesn't bring down the whole system. Programs are also prevented from writing over their own code. (Assembly language programmers are well aware of bugs that cause this to happen.)

The descriptor table for each segment defines whether the segment is for code or data. These segments have different characteristics.

A code segment is executable. A code segment may also (depending upon information in the descriptor table) be read as data. This means that data may also be included in the code segment. But code segments may not be written to. This obviously prohibits "self-modifying code" where a program creates or alters instructions in memory that it later executes. Self-modifying code may be strongly discouraged by programming textbooks (which doesn't stop programmers from using it), but the 80286 protected mode is a stern professor and absolutely prohibits self-modifying code.

A data segment is readable but not executable. A data segment may also be flagged in the descriptor table as protected from being written to, creating a type of read-only RAM.

This division of nonwritable code segments and nonexecutable data segments has a rather severe implication for existing PC software: we may shed a tear or two, but we're going to have to bid farewell to COM programs. COM programs, beloved by assembly language programmers because of the simplicity of

Diary of an

I traded my 16K machine and all those disks for Lotus® 1-2-3 and 256K. And immediately got the urge to merge. I started by merging regional statements in Maine. But before I could get to Iowa, I ran out of gas.

At 512K, I discovered what the coordinates IV169 looked like. I was so far out there it felt like I was walking on the moon. It didn't take long to find out 512K was nothing more than a walk around the block.

640K! Loads of space until I fell in love with integrated software and was back to cutting up files again. Sure, the other functions make my worksheet more persuasive, but I'm back to slugging in and out disks. Shades of 16K.



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Above Board PS has the parallel and serial ports, clock, print buffer, and RAM disk you'd expect from a conventional multifunction board.

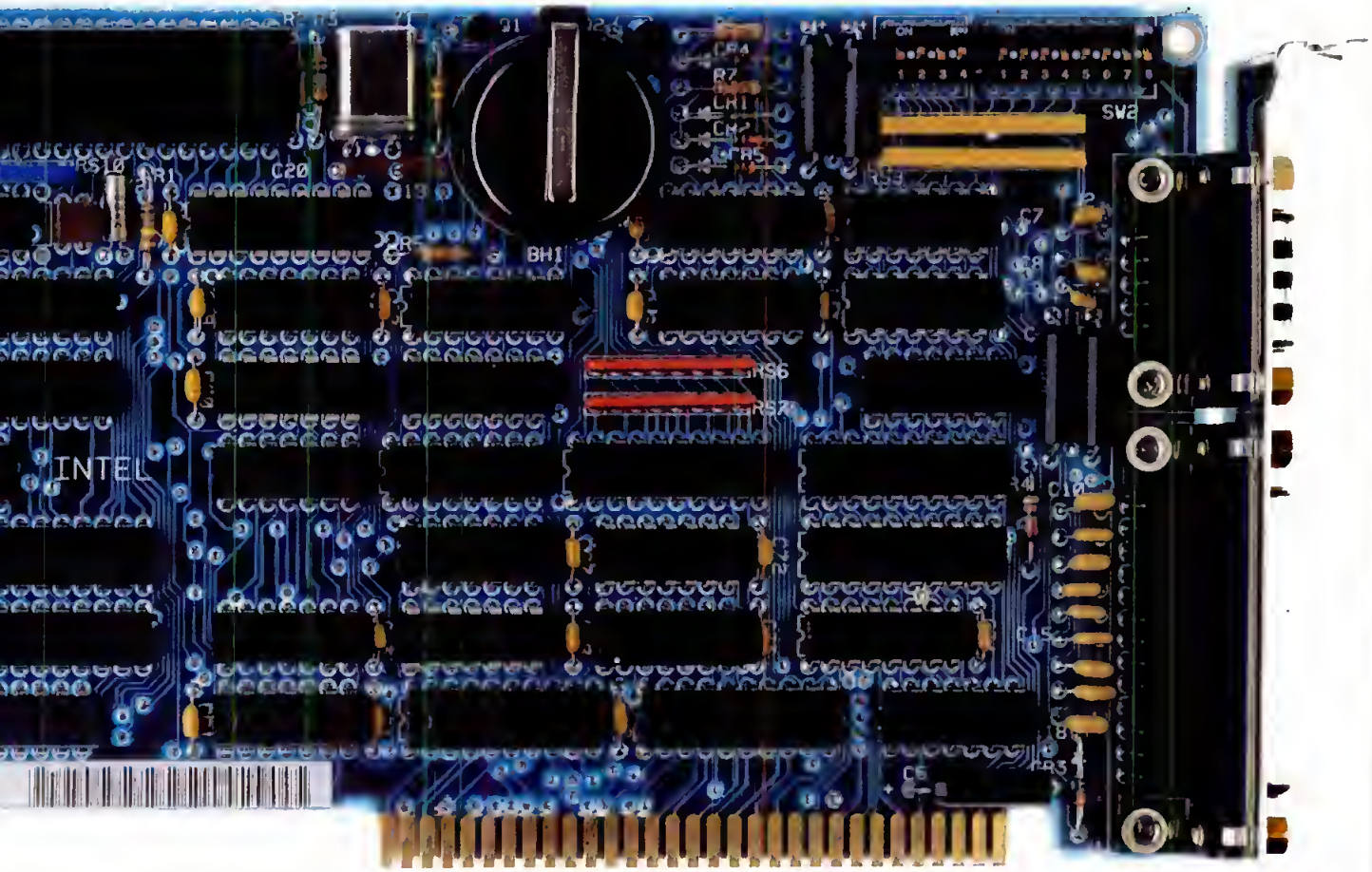
But why buy a conventional board when Above Board PS can take you from 256K all the way to 1.5 megabytes in one fell swoop, without even pausing for a breath at 640K.

So you don't need to hot-wire your way to the top anymore. With Above Board PS, the split worksheet is history. The new norm is windowing, pop-ups, and

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RAM speed on everything—even databasing and word processing.

The second-biggest difference between Above Board PS and conventional multifunction boards is the unconventional warranty on it. Five years instead of the usual two.

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Above Board PS is part of a family of products for the IBM PC, XT, AT and compatibles.

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using one segment for everything, will most likely not be able to run at all in a DOS version that supports 80286 protected mode.

DUAL-PURPOSE INTERRUPTS When programs do things they shouldn't, such as writing over their own code segments or the segments of other tasks, they cause an "exception" condition that generates an internal microprocessor interrupt. The operating system would take control and probably terminate the offending program, so that a single program in 80286 protected mode can't go haywire and crash the whole system.

These 80286 internal interrupts had their beginnings in the 8088. The 8088 has five predefined interrupts. When the microprocessor encounters an overflow during a DIV or IDIV (divide) instruction, for instance, it internally generates an Interrupt 0, which means "divide by zero." Often a program (or DOS) traps this interrupt and tells you about it.

Intel's documentation for the 8086 and 8088 (dating back, of course, to pre-IBM PC days) indicates that Interrupts 00 through 04 are "dedicated" and Interrupts 05 through 1Fh are "reserved," meaning that Intel planned to use them at a later date.

The designers of the PC and the authors of the PC's ROM BIOS (not Microsoft) ignored Intel's documentation in this regard and used these reserved interrupts for other purposes in the PC. This was not a smart move to begin with, and IBM has continued to use these interrupts in the PC AT. (This makes it compatible with the PC and XT, of course.)

The 80286 in protected mode (and even in real mode) uses some of these once-reserved interrupts. For instance, if an 80287 math coprocessor chip encounters an error, it will generate an Interrupt 10h. The operating system must then deal with this interrupt. However, in the IBM PC and AT, Interrupt 10h is the BIOS service for using the video display, and many programs use this interrupt, even those that ultimately write directly to the display memory.

A DOS version that supported 80286 protected mode and also ran existing programs would have to deal with all these dual-purpose interrupts that many programs use to get at the BIOS and that the chip uses to signal error conditions.

POSSIBLE ANSWERS It will be very interesting to see how Microsoft solves these problems. One extreme solution is to make a clean sweep and come out with a DOS version that won't run most existing programs, leaving software manufacturers to develop protected-mode versions of their programs and offer the product updates to registered users at modest cost. I do not expect the rules inherent in protected-mode programming to be very severe and time-consuming for software developers, and so this approach may not be quite as insane as it sounds at first.

■ A protected-mode DOS that ran existing programs would have to deal with dual-purpose interrupts that many programs use to get at the BIOS.

Another extreme solution is to kludge around all the problems I've identified (and some others that I've undoubtedly overlooked) and come out with a protected-mode DOS that is big and ugly but runs many existing programs. Perhaps it will switch back and forth between real and protected modes and allow protected mode only for those programs that are written for it.

One thing is clear: a DOS that supports 80286 protected mode will be the beginning of a grown-up operating system for the IBM PC.—**Charles Petzold**

easier, however, to use Orchid's documentation to edit the files yourself because this program is not foolproof. It failed to copy the EMM.SYS and RAMDISK.SYS files to my boot floppy because files with those names were already on the disk. They happened to be Intel's expanded memory manager and Microsoft's RAMdisk, and so maybe I should have been thankful that these files weren't wiped out. However, it did correctly put the RAMdisk at the bottom of the CONFIG.SYS.

The Conquest is a fine board as far as features, construction, and installation go, but its expanded memory manager proved to be the slowest in the random-access test of all the expanded memory boards tested.

Memory Companion PC

STB Systems' Memory Companion PC at first appears to be a plain and simple 1-megabyte expanded memory board for the IBM PC and XT. In fact, the board itself is so plain and simple that it won't even backfill conventional memory. The software and installation procedures, however, are dauntingly complex.

Although the manual indicates that the board can be installed in a PC AT (and the board is properly notched to avoid the second bus connector on the AT), you will not want to do it. The memory accesses will be slower because it uses the 8-bit rather than the 16-bit data bus. Moreover, you'll be better off with an AT board that provides both extended and expanded memory to be

PC MAGAZINE FACT FILE

Memory Companion PC
STB Systems Inc.
601 N. Glenville
Richardson, TX 75081
(214) 234-8750
List Price: 0K, $329; 64K, $349; 256K, $395; 512K, $645; 1 Mbyte, $1,145; 2 Mbyte, $2,145
Requires: PC, XT, AT, or compatible.
Type: Expanded memory
In Short: An overcomplex installation program with technical information hidden away on disk files mars this otherwise simple, straightforward expanded memory board.

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ready for a protected-mode DOS.

The functions of the eight switches on the board's single DIP-switch block are labeled right on the board, which is a nice touch. Two switches indicate an I/O address; STB says you can install four of these boards with four different switch settings—although the "preliminary" user manual I got (dated July 1985) does not say so and instructs you to set only one of the switches, depending upon whether the board carries 64K-bit or 256K-bit RAM chips. STB tells me it is working on new manuals.

When you look at the installation program and documentation, you'll think there was a mixup at the factory. The software is called *PC Accelerator (PCA)* and includes information about AT extended memory and video boards. STB is using this same installation program for a variety of products, an arrangement that is convenient only for the manufacturer. The full documentation for the *PCA* driver program is buried on the diskette in text files.

The *PCA* program includes the expanded memory manager and RAMdisks all in one driver file. The installation software incorrectly puts this file at the top of your CONFIG.SYS file. If you are installing RAMdisks and happen to have other device drives already in your CONFIG.SYS file (for Iomega's Bernoulli Box, for example), you'll be in for a shock when your Bernoulli Box drive letters are shifted to make room for the RAMdisks.

You may also find that some funny things are going on with the rest of your machine. When I ran CHKDSK, I found that my DOS memory was only 626K RAM instead of 640K RAM.

If you only worked with STB's Memory Companion PC board and software, you would never believe how straightforward installation of expanded memory really is. Should we blame this mess on Resicorp, which developed the software, or STB, which sells it? I say both.

ABM X2C

The ABM X2C sounds like a piece of military hardware, but it's actually a benevolent expanded memory multifunction board that can also backfill conventional memory. The board includes a serial port, parallel port, game port, and clock. Only the serial port connector is mounted on the backbrace of the board; the other two ports use cables connected to a mounting bracket that can be installed in an adjacent slot if one is available. The basic board can hold 1 megabyte, and an optional XRM Module gives you a second megabyte.

The most interesting aspect of this board is its use of an on-board 9-volt Ni-Cad battery to power the board's memory when your computer's power is turned off. An AC adapter that plugs into the backbrace of the board charges up the battery. While some boards include RAMdisk software that can survive a Ctrl-Alt-Del reset, an ABM X2C RAMdisk can survive blackouts.

■ The Memory Companion PC is so simple, it won't even backfill conventional memory.

Only RAM configured for expanded memory can be made nonvolatile; backfilled memory for DOS cannot. You can also specify how much of expanded memory should be made nonvolatile, in increments of 256K bytes. The documentation indicates that a single bank of 256K-bit chips will last 100 minutes with no power; all eight banks will last 10 minutes. If power is still provided to the AC adapter, the contents of the RAMdisk can last indefinitely. That is, you can turn off your machine and keep RAMdisk contents safe if the AC adapter is not also turned off.

The installation of this board is also interesting. The board has neither DIP switches nor jumper cables; you run an installation program from a self-booting disk to configure the board. This program can figure out that you have two parallel ports assigned already in your machine and assign the ABM X2C parallel port to LPT3. It also divides the board into expanded and backfilled conventional memory. These settings are stored in CMOS RAM on the board, much like the system settings on a PC AT. This RAM is preserved by the 9-volt battery regardless of whether or not you use the nonvolatile EMS feature.

A second installation program edits your CONFIG.SYS and AUTOEXEC.BAT files to include the expanded memory manager, RAMdisk software, and print spooler. The ABM X2C is configured to use segment D for expanded memory. If you have a conflict with another peripheral in that segment, the board can be upgraded with ABM's help to use segment E.

The ports used by the expanded memory manager to access the board are not documented. Since the board has no DIP switches or jumpers to change the address, an I/O conflict will prevent you from installing more than one ABM X2C to use as expanded memory in your system. ABM has 5-inch "Mini-EMS" expanded memory boards ($169 for 0K expandable to 1.5 megabytes) to let you increase total expanded memory to the 8-megabyte limit.

The manual consistently refers to the Lotus/Intel/Microsoft *extended* memory specification and then says: "This memory should not be confused with the EXPANDED memory of the IBM PC/AT." Getting the terms mixed up does not help relieve the confusion.

Although I am leery of boards that handle configuration through unchangeable I/O ports, the ABM X2C is very easy to install and get going. The nonvolatile expanded memory RAMdisk provides additional potential for RAMdisk use.

PC MAGAZINE FACT FILE

ABM X2C
ABM Computer Systems
3 Whatney
Irvine, CA 92718
(714) 859-6531
List Price: 256K, $395; 1 Mbyte, $572; 0K XRM module, $79; 1 Mbyte XRM module, $249; AC/battery option, $29
Requires: PC, XT, or compatible.
Type: Expanded memory
In Short: On-board battery backup for 2 megabytes of expanded memory lets you create nonvolatile RAMdisks. No-switch installation makes this an easy expanded-memory multifunction board to install.

CIRCLE 676 ON READER SERVICE CARD

All Card

All Computers' All Card supports the Lotus/Intel/Microsoft expanded memory specification, but EMS is relegated to secondary importance here. The All Card also implements its own unique solution to conquering the 640K-byte conventional memory barrier.

With All Computers' optional Memory Management Unit (MMU), the All Card board can increase the size of conventional memory from the normal limit of 640K all the way up to 952K. CHKDSK will inform you that you now have 952K of total memory. You can run *1-2-3*, Release 1A, and the Worksheet Status menu will tell you that well over 700K of memory is free.

The many problems involved in accomplishing this feat are enormous, however. Running the All Card with regular LIM expanded memory is easy enough, but taking full advantage of this board's ability to give you 952K bytes of conventional memory will require a commitment on your part to thoroughly integrate the All Card with the rest of your system.

In many machines, only the monochrome and color/graphics display memory (starting 740K bytes from the bottom of memory) and the 8K-byte ROM BIOS prevent DOS from using the full 1 megabyte of addressable memory. To let the All Card do its stuff, you must first remove the 8088 microprocessor from your system board (and the 8087 math coprocessor if you have one), plug them into the All Card, and run a cable from the board to the empty 8088 socket.

Memory Boards: Summary of Features

Manufacturer	Product name	List price*	Maximum memory on board (megabytes)	Maximum additional memory (megabytes)	Class	Expanded memory	Extended memory	Backfilling	Special hardware features
Cheetah International	Cheetah Card	$945	2.5	12.5 (on 5 boards)	AT	No	Yes	Yes	None
Tall Tree Systems	JRAM AT3-P	$349 to $669	2	6 (on 3 boards) for expanded memory; 2 (on 1 board) for extended memory	AT	Yes	Yes	Yes	Optional parallel, serial ports; laser printer driver
Quadram	Liberty-AT	$475 to $1,495	4	0 for expanded memory; 11 (on 3 boards) for extended memory	AT	Yes	Yes	Yes	None
Orchid Technology	Eccell	$595	3	9 (on 3 boards)	AT	Yes	Yes	Yes	Optional parallel, serial, or dual serial ports
MicroWay	MegaPage-AT	$595	3	9 (on 3 boards)	AT	Yes	Yes	Yes	Optional parallel, serial, or dual serial ports
Quadram	Quadboard-AT	$595 to $2,195	3.5	3.5 (on 1 board) for expanded memory; 11 (on 4 boards) for extended memory	AT	Yes	Yes	Yes	Parallel and serial port
STB Systems	Memory Companion PC	$329 to $2,145	2	6 (on 3 boards)	PC	Yes	No	No	None
Orchid Technology	Conquest	$395	2	6 (on 3 boards)	PC	Yes	No	Yes	Parallel and serial ports, clock
ABM Computer Systems	ABM X2C	$395 to $572	2	6 (on 3 mini-EMS boards)	PC	Yes	No	Yes	Parallel, serial, game ports; clock; battery backup for RAM
All Computers	All Card	$445 to $795	1	0	PC	Yes	No	Yes	Serial port, clock, optional Memory Management Unit
Intel Corp.	Above Board/PS	$445 to $1,195	1.5	6.5 (on 5 boards)	PC	Yes	No	Yes	Parallel and serial ports, clock

*For more detailed pricing, see fact file information.

Although this procedure is similar to installing an accelerator card, the All Card actually slowed down processor speed in the IBM PC I used for testing by about 10 to 20 percent (although the All Computers technical people told me this was not normal). All Computers also sells a high-speed option that substitutes a NEC V20 processor for the 8088. With the NEC chip installed, my results showed the normal speed advantage of the V20.

The All Card software includes a device driver called ALLMOS.SYS that, when it is installed in your CONFIG.SYS, gives you several options. You can also install ALLDISK, a RAMdisk that uses some of the 1 megabyte of memory on the board, and you can install ALLEMM, which turns the leftover memory into LIM expanded memory.

On the DOS command level (or in a batch file), you can also run ALLSIZE, which allows you to adjust the size of the memory used for DOS between 640K and 952K. Because your microprocessor is now on the All Card, the MMU can shift addresses around. The monochrome and color displays, normally at segment B000, are shifted to segment F000. The 8K ROM BIOS, normally at FE00, is shifted to EE00. Everything below that is available for programs that run from DOS. Whenever the BIOS writes directly to the display memory (code that the MMU can trap), the MMU routes it to the displaced address. When ALLSIZE is run, ALLMOS traps all BIOS interrupts to help out with this rerouting.

The scheme is very clever but fraught with problems. The main problem is that the ROM BIOS is not the only program that writes directly to the screen memory—many common applications programs do also. The manual says, "Although strict DOS programming rules discourage applications from directly accessing memory above the 640K mark, some programs do write directly to video memory. Most applications will run in a 952K DOS environment without modification. Those applications which do write directly to video require minor modifications."

■ All Computers' All Card supports the LIM expanded memory specification, but EMS is relegated to secondary importance here. The All Card implements its own solution to the 640K-byte memory barrier.

This is not quite realistic. Virtually every word processor, spreadsheet program, and pop-up utility for the PC writes directly to display memory. Most database managers do not, but many communications programs do, and all programs that use graphics do. All of these programs require "minor modifications" to run under a DOS environment larger than 704K. These modifications involve patching the programs so they address video memory at segment F000 instead of segment B000. The MMU cannot simply trap memory accesses to B000 because with a bigger DOS, segment B000 may be a valid segment address for a program's data.

Patching all these programs yourself would be a tough job, so the All Card software includes ALLPREP, a program that patches your applications, provided your applications are among the 21 that have "PAT" files on the All Card disk. These include *1-2-3*, Releases 1A and 2; *Crosstalk XVI*, Version 3.4; *GEM*, Version 1.1 (for Compaq, Hercules, and the IBM CGA); *SideKick*, Version 1.11c; *Symphony*, Versions 1.0 and 1.1; *Framework*, Versions 1.00 and II; *MultiMate*, Version 3.30; *WordStar*, Version 3.30; *WordPerfect*, Version 4.0; *TopView*, Version 1; and a few others.

You can tell by this jumble of version numbers that assembling PAT files for the many PC programs that write directly to the display will be a never-ending job. But let the manual speak: "If your particular application is not listed, we have not created patches for it yet. However, we will be glad to modify your application to run in a 1-megabyte DOS environment for you, and add it to ALLPREP, at no charge."

Fortunately, in the interim you can use ALLSIZE to decrease the size of conventional memory down to 640K or 704K (neither of which requires shifting the video display address) for those applications missing from ALLPREP. Otherwise, if your application writes directly to the screen at segment B000, it may write over itself or its data and crash.

Once you have run ALLPREP for an application, you must run ALLSIZE at least once, if only to set the conventional memory size to 640K. Otherwise the application will try to write to the display at segment F000 and you won't see anything. This will not cause a crash; you just have to type the keystrokes that will exit you from the program. When ALLSIZE is run once, any accesses in segment F000 will be directed to video, although with a conventional memory size of 704K or less, the video will also be accessible at segment B000.

If you also use the All Card's expanded memory, you should be aware of how that works. When the expanded memory manager is loaded, it uses the entire board (less backfilled RAM) for expanded memory. ALLSIZE later reduces the size of expanded memory to increase conventional memory. If all of expanded memory is allocated

PC MAGAZINE FACT FILE

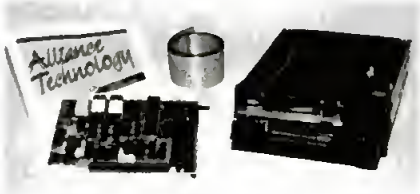
All Card
All Computers Inc.
102 Bloor Street West, 12th fl.
Toronto, Ontario M5S 1M9
(416) 960-0111
(800) 387-2744
List Price: 384K without MMU, $445; 256K with MMU, $695; 1 Mbyte with MMU, $795; piggyback board expandable to 6 Mbytes, $195; high-speed option, $100,
Requires: PC, XT, or compatible
Type: Expanded memory
In Short: Clever rearranging of system addresses allows you to get 952K of conventional memory in addition to normal expanded memory. However, using this extra conventional memory is far from painless.

CIRCLE 675 ON READER SERVICE CARD

HIGH SPEED TAPE BACKUP NOW $475

Alliance Technology of Sunnyvale, CA has broken the $500 price barrier with a high speed, high performance streaming tape system able to back up an entire 20MB hard disk on an XT or AT computer in less than five minutes for $475.

"Our 25MB and 60MB systems are high speed systems similar to those sold by Alloy, Everex, Maynard, Sysgen and Tecmar," said Alliance Technology president Jochen Schude. "We all buy the same hardware but Alliance's window oriented software is significantly more powerful than others. Our direct marketing channel is more efficient so the end user pays less than $500 for features ordinarily selling for $900 to $1,500. Our technical support department is the very best."



"Our user prices are about the same as floppy tape systems from Irwin, Peachtree Technology, and Interdyne, but our backup time is dramatically faster and the hardware reliability is much greater."

The Alliance systems can do high speed image, partition, or file by file backups with read-after-write verify. "Our window oriented software utility is compatible with more systems, easier to use, and resembles Lotus' 1-2-3 menu," explained Schude. "Our tape controllers are short length cards, and the tape drives are 5.25 inch half height."

Alliance also sells a $575 portable backup system similar to the Maynard Maynstream that can be moved from one office to another to back up any number of XT's and AT's. 60MB cartridge tape systems (similar to Everex's) are $675.

25MB Streaming Tape Subsystem-$475.
60MB Cartridge Tape Subsystem-$675.
(extra controllers $139.)

Alliance Technology, Inc. 510 Lawrence Expy, Suite 210, Sunnyvale, CA 94086.
(800) 621-0854 ext. 700 or (408) 727-6200.
CIRCLE 499 ON READER SERVICE CARD
(advertisement)

■ MEMORY OPTIONS

by other programs, ALLSIZE will not be able to increase the size of your conventional memory.

What if you have an application patched for conventional memory greater than 704K and an unpatched pop-up utility? Simple: you cannot use the two programs together. Now you have to start remembering which of your programs are writing to video at B000 and which at F000. You can run ALLPREP to unpatch

■ The All Card's packaging heralds it as "a life-time investment" with "growth potential." This for a board that is not EGA compatible?

the applications you've patched if this starts to become too much for you.

One topic entirely ignored in the All Card manuals is IBM's Enhanced Graphics Adapter. In the EGA graphics modes, the display memory is at segment A000, which is not shifted to another segment by the All Card. This too is very simple: the All Card must be set for a conventional memory size of 640K to use the additional EGA graphics modes. (All Computers is working on a software solution for the EGA, but the EGA has been around for about a year and a half, so it can't be an easy fix.)

I'm spending so much time discussing the All Card because its release has been surrounded with an excessive amount of hype. The board's packaging heralds it as "a lifetime investment" with "expanded growth potential." This for a board that is not compatible with the EGA? A board for which the manufacturer must develop patches for almost every new application you buy?

In actual use, the All Card is not even as easy to use as I've made it seem. I haven't talked about the numerous "Allocation problem" and "Invalid COMMAND .COM" system halts I experienced. I haven't mentioned the fact that I could run the .EXE program for *1-2-3*, Release 1A but not LOTUS.COM. I haven't discussed the various error messages I got from the ALLMOS driver on Ctrl-Alt-Del resets (one even told me the MMU was not installed), which required turning off my system.

PC Magazine contributing editor Stephen Manes coined the term "fritter" to describe the terrible waste of time involved in installing a new PC peripheral ("Fritter: The Ever-Present Enemy," *PC Magazine*, Volume 5 Number 4). The All Card's fritter factor is higher than that of almost any other board I've worked with.

Charles Petzold is a contributing editor of PC Magazine.

PC MAGAZINE EDITOR'S CHOICE

Among the combination extended and expanded memory boards, Orchid Technology's ***Eccell*** *and MicroWay's* ***MegaPage-AT*** *stand out. These two products use the same board, include much of the same software, and sell at the same list price. The use of software to divide these boards between extended memory and expanded memory made me suspicious at first, but the approach eventually won me over. Right now, Orchid's manual and installation software give it an edge, but MicroWay's customer support may be far more valuable.*

Intel's earlier Above Boards were fine products with some documentation and installation problems. But this is a company that wants to get it right, and the improvements in the ***Above Board/PS*** *make it the new standard for expanded memory boards and for multifunction boards as well. The AST SixPakPlus and other 384K-byte multifunction boards have served us well over the years, but Above Board/PS's time has come.*

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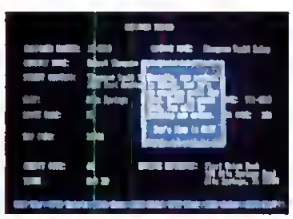
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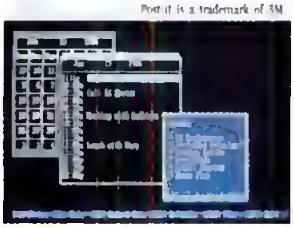
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CIRCLE 282 ON READER SERVICE CARD

Conceived on a Mainframe... Born on an AT

Ask a CPA about accounting software for PCs, and chances are he'll recommend an accounting package with multiple modules. If the package runs under PC-DOS, it probably won't support multiple users... at least in terms of supporting multiple users *within* each module.

But ask him what would be ideal for your organization, and he'll probably tell you that a true multi-user accounting system would be perfect.

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CIRCLE 394 ON READER SERVICE CARD



The Multi-User Accounting System

AN ENTERPRISING ACCOUNTING SERIES FROM BPI



The brand-new BPI Enterprise Series is a powerful five-module system with distinctive general ledger and payroll capabilities.

BPI Systems Inc. has become a well-known name in the industry since it introduced one of the first full-function accounting software packages for personal computers in 1979. In 1981, the company developed five accounting modules—General Accounting, Accounts Receivable, Payroll, Inventory Control, and Job Cost—to be sold under the IBM label in IBM Product Centers. Since then, BPI has broadened its product line to include a full spectrum of accounting packages.

The *BPI Enterprise Series (BPIES)* is a completely new product according to BPI; it's not an upgrade of the company's older *ENTRY Series*, which was aimed at very small businesses. Five modules of Version 1.0 are currently available: General Ledger, Accounts Receivable, Accounts Payable, Payroll, and Network Support. BPI plans to introduce Order Entry, Report Writer, and Inventory Control modules for this series later in 1986.

BPIES offers networking capabilities on IBM's PC Network (not the IBM token-ring LAN); the maximum network configuration supported is one server and three user nodes. As the network support documentation indicates, use is restricted to one user per application at any one time, so *BPIES* is not a true multiuser system. (This review is based on a single-machine use of the BPI software.)

BPIES is no small system. Each module contains from four to six disks, and installing all five modules will tie up nearly 2.5 megabytes of your hard disk. An installation program makes the process fast and easy.

To log on to the system, you must enter a six-character user ID. Assigning separate IDs allows each user to maintain individual screen color/display options and personal calendars. A password can be created for each application to help ensure proper segregation of accounting duties.

PULL-DOWN MENUS A well-designed system of pull-down menus lets you access each module's five functional areas, which are displayed across the top of the screen: System (for setting system parameters), an applications-specific parameters and inquiry area for each module, Edit (for editing applications master files), Enter (for entering transactions), and Print (for printing documents and reports). The menu commands themselves are arranged from top to bottom in the order that you are most likely to use them. *BPIES* takes full advantage of the function keys, using, for instance, F1 for context-sensitive help and F2 to switch to command mode.

From the System menu, you can perform several useful functions: you can initiate special mode printing, such as compressed and bold, for one of the many printers that *BPIES* supports. Menu selec-

tions can be stored in a "Command Queue" and executed in an orderly sequence to help structure work flow as well as queue up reports. In addition, the System menu offers access to up to 21 DOS commands, providing some flexibility in jumping back and forth between accounting chores and other work.

BPIES's ability to suspend functions is quite useful. Say you are processing a General Ledger transaction when you realize that you must first add a necessary account to the chart of accounts. You can easily perform that task and then switch right back to where you were.

The documentation discusses the dangers of shutting down your PC at certain critical points in the accounting process to avoid corrupting your data files. We powered down improperly several times, yet our data wasn't corrupted upon reentering the system. Representatives from BPI told us that the system handles emergency file closings very well and that data corruption from improper exiting should not be much of a problem.

GENERAL LEDGER *BPIES*'s General Ledger is a highly interactive system that provides a format for simplified data entry. As you enter a transaction, both sides of the entry must balance before the program will accept it. This kind of precaution is typical. However, when the module accepts an entry, it immediately updates all the affected accounts. This procedure departs significantly from the "on-line entry/batch update" approach that most comparable systems take. If errors are introduced, you must use an adjusting entry because you cannot edit a transaction after it is posted.

As is typical in general ledgers, first you must establish data files for your company by creating a six-character company ID and entering your fiscal periods. You can use 12 or 13 accounting periods per year, but only 2 periods can be open at any one time. This restriction severely limits companies that have difficulty closing out a month within the next accounting period.

BPIES provides a predefined chart of accounts that you can modify according to your needs. It uses a three-segment coding structure divided into division, natural account, and department. The division and department segments are optional and may consist of one to four digits, but the account must be three or four digits. Planning your account numbers carefully is important because the account number determines the default order in which they will appear on reports.

Careful planning of your divisional and departmental coding schemes will help you do a top-notch job of cost center and responsibility reporting. However, you needn't remember every account number when entering transactions. The system has a nifty "selector" function for viewing accounts in name or number order; when you see the account you're looking for, you highlight it. Press Enter and the name and number are transferred to the proper location on the data-entry screen.

After establishing the chart of accounts, you can enter actual historical balances, budget information, and current balances. The availability of historical and budget information will be useful for comparative financial reporting, but it is not necessary for using the system.

Next, you define specific journal entries. *BPIES* maintains an eight-character reference field to identify and print selected journal entries. A General Journal entry, which includes up to 12 account distributions and ten lines of memorandum detail (text), is a very handy feature. If you like, the system will automatically reverse an entry when the current period is closed. In addition to the General Journal, the General Ledger can accept input from "checkbook accounts," cash journals, automatic journal entries, and external entries from an ASCII file. You can define up to nine checkbook accounts for segregating your cash recording and facilitating the cash-management process.

AUTOMATIC JOURNAL ENTRIES BPI designed several unique features into the cash-journal and bank-deposit options. The cash journal allows you to record daily sales receipts from separate cash drawers or registers. You can separate sales into as many as nine accounts, such as softgoods, hardgoods, and sales tax. The program lets you establish automatic journal entries for such recurring entries as rent, loans, utilities, and adjusting or closing entries. You can submit them as a complete batch to the general journal or select them one at a time and modify them before you enter them. Used wisely, this feature can significantly speed your month-end closing process. You could establish standard entries where only the dollar amounts will change. Then, each month, you would simply modify the amounts appropriately and—voilà!—your month-end entries are complete.

The external entry feature is useful for consolidating data imported from other systems. Use it with caution, though: the system's error checking during data importation seems incomplete. When we tried this feature, an unbalanced entry corrupted our data files. The external entry feature requires that your data be contained within an ASCII file with each data element in a separate line (record). We would have expected that data would be presented a record at a time; a single data element per record seems very awkward. At any rate, a clearer, fuller explanation of how to create such files would be a very useful ad-

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dition to the documentation.

When you enter transactions, *BPIES* does not produce a listing of your transactions or an automatic audit trail of the entries. This is not surprising, given the software's approach to immediate ledger updates, although we still believe that a simple transaction "register" of items entered would be useful. If, like us, you wish to create an audit trail for these general journal entries, you need to enter the date in the reference field and then print a report of the data you entered (selecting only those records with the appropriate date).

GENERAL LEDGER REPORTING The *BPIES* General Ledger provides impressive flexibility in financial reporting. You can select individual commands to print the ledger, journals, individual account status, and financial reports. The General Ledger module includes a predefined balance sheet, income statement, and trial balance, as well as a relatively sophisticated menu-driven report-formatting option that lets you custom design your financial reports.

The manner in which you select data to be printed in a given report format is well conceived. It gives you the ability to select from up to 20 combinations of data elements and computations based upon these data elements (see Figure 1). This feature provides an easy means of generating a wide variety of comparative reports. Combined with the command queue facility, it allows you to generate a set of reports with many revealing views of the data and only a few report definitions.

When designing custom reports, you can compute a divisor for producing ratios within the report. Thus, you can report values as a percentage of sales, accounts receivable, accounts payable, capital, or any account combination that is meaningful for your analysis.

ACCOUNTS PAYABLE Accounts Payable features that can help you manage your payables include partial payments of vendor invoices, a cash-requirements report, an account aging report, payment selection based upon discounts available, solid vendor status and activity reports, and a bank-reconciliation function.

The "voucher" method is used to keep track of amounts due to vendors. Vouchers are internal accounting control documents that summarize information associated with one or more invoices from a vendor. With *BPIES*, invoice amounts due can be distributed to as many as 12 accounts. The software facilitates your computing and recording of discounts taken or lost and tracks the check or checks used to satisfy the obligation. Unlike the *BPIES* General Ledger, in which transaction entries are updated immediately, the Accounts Payable module lets you apply batch-processing accounting control techniques for vouchers.

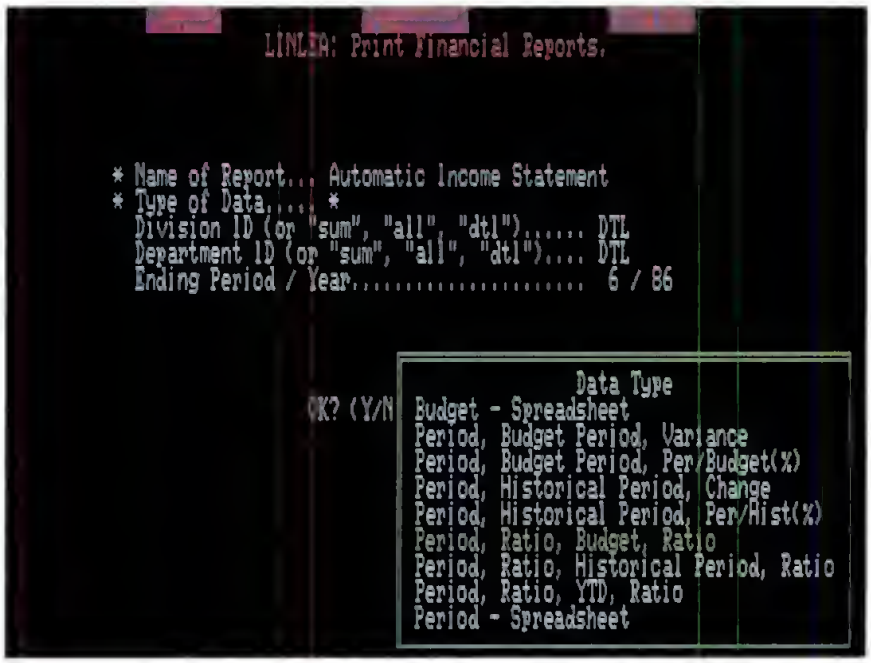


Figure 1: *The financial reporting screen has a window containing same of the 20 data options for preparing a report. This unique function is useful for performing comparative analysis of actual, historical, and budgetary information.*

You can enter your vouchers daily, including all invoices, credit memos from vendors, and deduction memos (your notice to vendors that you are reducing an invoice amount). Newly entered vouchers are posted to the voucher journal, where you can update them before selecting them for payment. The data-entry facility, consistent with that of the General Ledger, includes a special selector function that eliminates the need to type a full name or ID for vendors or accounts.

A batch of vouchers can be any size. The vouchers are automatically numbered with two digits for the period and a four-digit sequential number representing the count of vouchers done in the accounting year. For example, 10–1,020 would be the 1,020th voucher of the year, processed in the tenth period. The system checks to verify that an invoice number is not a duplicate from a vendor in the current period—in other words, that you aren't paying the same invoice twice. But if you had already created a voucher for the invoice in a prior period, the system will not alert you. You must depend on administrative controls to avoid processing duplicate vouchers for the same invoice. Also, the program lacks a function to search or print reports sorted by the invoice number.

Checks are prepared for a single checkbook (cash account) with the payment-selection process. You can select vouchers for payment in four ways: by vendor number, vendor name, due date, or discount available. If you choose the discount-available option, you can review and select items for priority payment.

The Accounts Payable module makes a distinction between a regular vendor for which you maintain activity throughout the year and an occasional vendor with

which you may only have one or two transactions and do not wish to maintain account history information. Partial payments can be made to regular vendors but not to occasional vendors.

Checks can be printed in a single format, on forms available from Rapidforms or your office supply dealer. You can also record manually produced checks to properly relieve amounts due the vendor and record distributions to the General Ledger. Any check can be voided, as long as you have not closed the period in which the check was written. Voiding a check prompts the system to generate the proper General Ledger transactions to reverse the entry and also modifies the status of any voucher paid by the check.

To speed voucher data entry, you can establish up to four General Ledger accounts. When you enter the vendor ID or name, it automatically displays these account numbers, accepting the appropriate amounts and/or an override to the default accounts.

As you might expect, *BPIES* modules generate useful information for management as a by-product of performing the necessary accounting operations. For example, the vendor information maintained by the system includes activity information helpful to sales and marketing, such as year-to-date (YTD) totals of purchases, payments, discounts, finance charges, vouchers, and checks.

The bank-reconciliation feature could be very handy for keeping track of bank accounts. The check and deposit reports are especially useful, allowing cross matching against a bank statement. After you reconcile your checks and deposits, you can prepare a summary report by entering checks and deposits not yet recorded in your accounts payable system and any outstanding adjustments (see Figure 2).

Like any system, the *BPIES* Accounts Payable module has its limitations. The restrictive, system-dictated check format is certainly one example. Payables information cannot be exported (to, say, a spreadsheet or a database for analysis), and the system does not produce 1099 forms. These are not blockbuster constraints, simply points you'll want to ponder if you are considering *BPIES* for your accounting chores.

■ *BPIES* generates useful information for management as a by-product of its accounting operations.

ACCOUNTS RECEIVABLE The *BPIES* Accounts Receivable module offers several unique twists. Like most systems, it gives you two ways to handle your customer accounts: balance forward and open item. However, *BPIES* offers three types of balance-forward accounts: regular accounts in which payment is due subject to predefined terms, revolving-balance accounts, and fixed-payment accounts.

Two options are available to handle finance charges for revolving-balance accounts. With the Average Daily Balance Method, you can set a minimum amount to which the system applies a finance charge based upon the average daily balance of the customer's account. The Level Method establishes two levels of finance charge, each with a percentage rate and minimum balance above which the charge is applied. For example, the Level 1 finance charge may be 1.5 percent per month on balances from $10 to $500. The Level 2 finance charge (assessed on balances over $500) could be 1.25 percent monthly. The finance charge variables apply to all customers of a given type within a company.

Customers assigned a fixed-payment account status are expected to pay a fixed dollar amount each billing period until their balance is paid in full. They are not assessed finance charges unless they miss a payment. For open item accounts, *BPIES* captures and maintains individual invoices as long as necessary until you enter sufficient payment against them.

Setup includes establishing master file records for each of your customers. To the basic data you can add a variety of useful

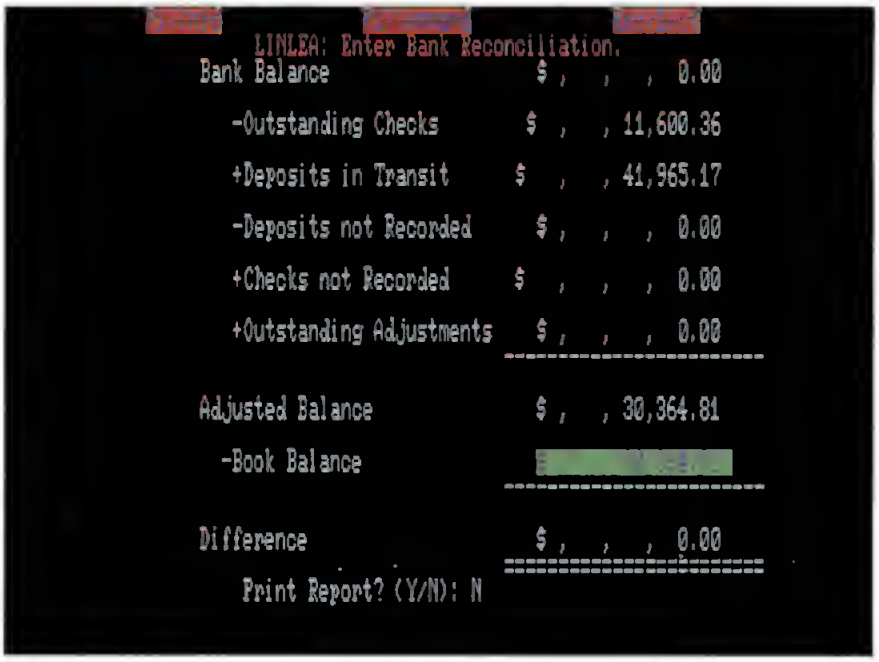


Figure 2: *After reconciling your checks and deposits to your bank statement, you would prepare this summary report by entering checks and deposits not yet recorded in your accounts payable system and any outstanding adjustments. The system will supply information from the General Ledger and Accounts Payable modules and show you any difference between your book and adjusted balances.*

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historical customer information, including high balance per account life, times billed (YTD and forever), and times past due (YTD and forever). With data like this available, you should soon develop very informative profiles of your customer base.

An account can be marked for deletion automatically at the end of an accounting period if the account has a zero balance. However, we would not advise using this feature because you could lose useful history data on a customer.

Five types of invoice transactions can be entered, including normal invoices, credit memos, debit memos, cash invoices, and void invoices. Invoice information is entered in typical fashion: an optional eight-character field is available for purchase order number. Quantity/price extensions are done automatically but sales-tax computations are not, which can be annoying.

Here, as in the Accounts Payable module, the processing can be organized into batches to facilitate accounting control. However, you can review batches on your display only before they are accepted. We would prefer to see a forced batch listing for review and approval before invoice printing.

Receipts processing is relatively straightforward. The discount percentage rate from the terms code for the customer is used to compute the discount, if an invoice qualifies. You can override this, of course: if an invoice is in dispute, it can be put temporarily on hold until the dispute is resolved. Held invoices are not included in aging reports and do not accumulate finance charges.

Automatic charges and finance charges are meant to be assessed on accounts once every period, but the *BPIES* Accounts Receivable module provides no control, only a reminder against doing it twice or more in the same period. Administrative controls should suffice in establishing adequate controls, but we inadvertently succeeded in doubling up on our automatic charges. That's not a bad way to increase revenue, but your customers (and auditors) are bound to catch on.

The *BPIES* Accounts Receivable module provides a wide array of predefined documents and reports, as well as the printer-selection and command-queue features. Customer invoices and statements must be printed in a single predefined fixed format on continuous forms—again available from Rapidforms or your local office supply dealer.



Figure 3: *This on-screen employee status report shows some of the information that* BPI Enterprise Series *will maintain on your employees. In this mode, you can obtain a summary for each employee simply by scrolling the screen. For many small businesses, this feature may meet some of the needs of a personnel system.*

PAYROLL *BPIES*'s Payroll module, the flagship of the *BPI Enterprise Series*, reflects a variety of pay options as well as some of the latest developments in the Internal Revenue tax code. For example, it can accommodate four methods of calculating commissions, processing of tips, multistate withholding tables, accounting for IRA contributions, handling of Section 401(k) plans, and the 941 information report.

As with most payroll systems, the work required to set up the *BPIES* Payroll module is significant. The services of your accountant may be helpful to guide you in making the proper choices. However, the menu and data lookup orientation of this system make the tasks much more palatable than usual. We applaud the Payroll module's effective use of tables. Once your tables and employee master files are set up, payroll processing is a breeze.

To set up your payroll, you first complete seven screens of general information. For example, the system needs to know if you have FICA-exempt employees, whether you'll be processing after-the-fact payrolls (where checks are cut outside the system) and whether you'll want to manually distribute wages. If you'd like, the system can write a check to the federal government for FIT and FICA amounts. For hourly employees you can specify up to five different rates of pay. If your company has employees who will receive tips as part of their income, you must enter the appropriate information so it can determine tips deemed to be wages under the current federal guidelines.

After setting up your General Ledger control accounts for federal taxes, you select liability accounts from a table for any state as well as for special situations such as employees who live in New Jersey and Connecticut but work in New York. This feature makes it easier to keep track of your liabilities to various states. You can create up to 99 payroll departments distinct from the departments set up in your Gener-



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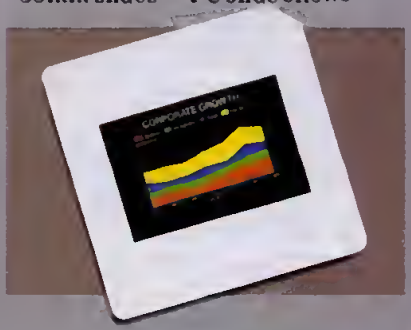
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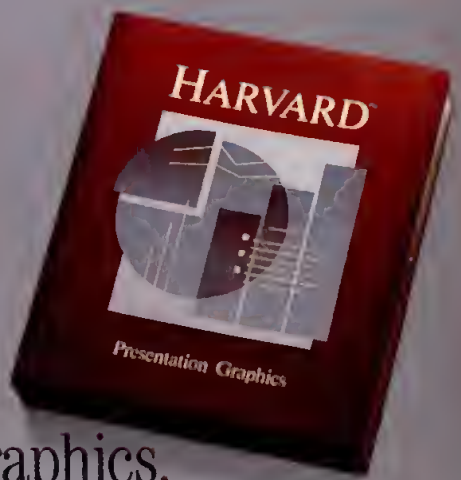


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al Ledger account IDs but correlated to them.

You have up to 14 options for calculating deduction amounts, including some peculiar to certain states and municipalities. For certain deduction methods you can specify annual ceiling amounts. For IRA deductions, the system calculates the FICA withholding amount but does not withhold federal taxes. It normally adds the IRA contributions to gross pay, but the employee's account can easily be adjusted to arrive at net pay if you wish. The system even allows the IRA contribution to be treated properly for vacation pay. A special computation is available for state income-tax withholdings on an IRA, but local withholdings must be calculated manually. The Payroll module will handle employer-sponsored 401(k) contributions if the plan is not subject to local withholding taxes and if a set percentage amount will be contributed each pay period.

The system can establish up to four separate schedules to compute commissions, each consisting of one of four methods, including base pay plus percentage of sales with a fixed or graduated scale, base pay plus piece rate, draw against commission, and manual calculation.

Once you've made all your initial choices, you set up your employees' accounts in a detailed master file. In addition to YTD history, the host of other information that can be maintained for each employee can take up as much as five screens (see Figure 3). Three employee pay types are possible: salaried, hourly, or commissioned. An employee's gross wages can be distributed to up to five different General Ledger accounts on a percentage basis. In addition to FICA, FIT, and SIT, you can assign up to six deductions to each employee using 1 of the system's 14 methods for calculating that deduction.

PROCESSING PAYROLL Once you have established your employee master files, you're ready to process payroll. You have four choices of pay period: weekly, biweekly, semimonthly, or monthly. Only those employees paid during your selected period will appear on the screen for processing. In addition to hours worked, other items such as sick pay, vacation pay, expense reimbursements, and Earned Income Credit can be included. As you enter each type of income, the gross pay, deductions, and net are automatically recalculated on-screen. For commissioned employees, you're only prompted to input the relevant information, based on their commission-computation method. Part-timers and other employees with nonstandard hours can be easily accommodated. Onetime upward adjustments such as bonuses and onetime downward adjustments can be performed easily after you've manually computed the amounts.

■ The payroll system can establish up to four separate schedules to compute commissions.

Aside from the normal processing of payrolls and employee adjustments, the last step is the quarterly production of 941 information. This data can then be printed on a report that mirrors the actual IRS Form 941 (Employer's Quarterly Federal Tax Return) for paying Uncle Sam any undeposited taxes due.

In addition to the 941 report, the BPIES Payroll module produces a whole multitude of useful documents and reports. Particularly interesting is the audit report, which shows employee pay changes by pay period. You can check this report to make sure the information recorded is consistent with information in other records, such as time sheets and personnel files. Payroll checks can be produced, though in a fixed format only. At year-end, but before closing payroll at the end of the fourth quarter, you can print IRS Form W-2s on continuous-form stock.

DOCUMENTATION AND SUPPORT The documentation is packaged in traditional IBM-style binders and slipcases, one 200-page set for each application, and includes a helpful tutorial. When you later come across a process or procedure, you have a point of reference from the tutorial. The appendixes offer sample reports and instructions on how to proceed when you receive specific error messages. A glossary of terms and an index are also included.

Checklists at the end of various chapters summarize the tasks required to set up and close your own books. A table of system capacities shows limits on dollar amounts and other data element sizes. The manuals offer no guidance, however, to help you estimate the disk space required to store master file or transaction records so that you can appropriately size the hard disk for your system.

We had problems using *BPIES* with certain memory-resident utilities. The folks from BPI said that they are keeping track of which products cause problems, so call them if you have a question.

The *BPIES* modules place in the medium to high end of the market relative to their competition, with an acceptable degree of accounting functionality. General ledger reporting and payroll are its most distinctive capabilities. Most of its shortcomings simply relate to the lack of features that might facilitate accounting controls. But this system is very new; BPI's admirable track record gives us confidence that the *BPI Enterprise Series* will mature with future releases.—**G. William Dauphinais, Timothy J. Lee, and Michael A. Yesko**

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BPI Enterprise Series
BPI Systems Inc.
3001 Bee Cave Rd.
Austin, TX 78746
(512) 328-5400
List Price: General Ledger, $795; Accounts Payable, $795; Accounts Receivable, $795; Payroll, $795; Network Support, $795
Requires: 320K RAM, 80-column printer that can print 132-character lines, DOS 2.1 or later (DOS 3.0 for networking).
In Short: A powerful five-module system with especially strong Payroll and General Ledger sections. Several unique touches distinguish it, but it suffers somewhat from a lack of accounting control features.

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PROJECT MANAGEMENT UNDER $200

If you've written off project management software as a luxury item, think again. These programs may not be as feature-laden as their more costly counterparts, but they'll fulfill many users' needs.

Project management is one of the highest-priced PC tasks. But while entrenched companies like Microsoft, Breakthrough, and Software Publishing struggle for the ballooning project management software market, some renegade software companies are carving out low-end niches. These companies have recognized the existence of a value-conscious business and professional crowd that needs project management software to replace manual methods of planning, managing, and scheduling from wall charts to napkin sketches. The software publishers are generally small and unknown, with little money for the two things most responsible for bringing a product to the attention of the press and the public: advertising and public relations.

PC Magazine searched out and tested nine such project managers with list prices under $200. We discovered that the low end of the project management market is a tricky place. You'll find versatile packages that allow you to pick and choose the aspects of project management best suited to a particular task. What you won't find, however, are full-featured products that offer absolutely every function you need for every project.

They all have certain basics, however; all will outline for you the steps necessary to complete a project and calculate time, resources, and money. They may use different methods to reach this goal, but they share a common lingo and sometimes even common commands.

CHART OF GOLD The two bases of this common lingo are Gantt and PERT charts, the most powerful tools at the project manager's disposal. A Gantt chart is a simple graph that lists dates across the top of a page and tasks and resources down the side. Corresponding lines display the interdependence of tasks, demonstrating the "critical path": the sequence that must be followed to complete the project.

PERT charts show the same information from a different perspective. Each task is represented by a box, with input to and output from future and preceding steps. The result is a road map of the project. PERT data is flexible, incorporating the normal, most-optimistic, and least-optimistic projections for completion.

More-expensive project management packages for the PC blend Gantt and PERT charts to give you a multifaceted view of project data (see "Project Management Software: The Top Sellers," *PC Magazine*, Volume 5 Number 3).

"The PERT chart is the most important thing," says Lee Harris of Software Publishing Corp., which manufactures the

Harvard Total Project Manager. "A critical path doesn't mean anything if it's not held together in an efficient manner." But while PERT charts are more powerful and detailed, Gantt charts are certainly easier to use and understand. Lower-priced programs are primarily Gantt-based, and some use neither Gantt nor PERT charts.

Advanced Pro-Path 6

Advanced Pro-Path 6 from Softcorp Inc. is generic in the supermarket sense of the word, offering the high-end functions in a no-frills package. A Gantt-based program, it includes all the basic scheduling and planning functions and does them as well as higher-priced programs.

When asked how *Advanced Pro-Path 6* differs from the market leaders, a company spokesman said it lacks network capabilities and handles fewer tasks. The latter may not be a great drawback, as most people using a low-end project manager won't be involved in 450-task projects.

The *Pro-Path* package includes a tantalizing 20-minute self-running demo that, because it is not interactive, will have you itching to bang away at the keys yourself. The demo goes beyond introducing *Pro-Path;* it is a good initiation to project management concepts in general. After sitting through it, you may feel qualified to tackle a high-end program like Breakthrough Software's *Timeline*. After wading through the detail-laden documentation, you'll feel like an expert.

The program lets you display a project's different stages of development in different hues if you have a color monitor.

Scheduling and Control

Scheduling and Control from Softext Publishing Co. is less sophisticated than *Advanced Pro-Path 6*, but at less than half the price it has a better price/performance ratio. A Gantt-based scheduling tool, it is aimed toward people who know they need a project management package but have no knowledge of—or even interest in—how the programs work. *Scheduling and Control* will give them a thorough and painless indoctrination.

The program's tutorial requires some effort on your part, but if you stick with it, you'll end up with a strong project management foundation. The manual is mostly devoted to introducing concepts, followed by a short, clearly written user's guide.

While it isn't strictly oriented toward PCs, the text's brevity is certainly customized for the PC user's notoriously short attention span. This text won't turn anyone into an expert, but it can serve as a refresher course or a good briefing for someone embarrassed about not knowing the concepts to begin with.

Softext's vice-president of marketing and operation, Gary Berzack, says he would like to see *Scheduling and Control* become "the *WordStar* of project managers"—that is, reliable, unpretentious, and open about its limitations. This is an admirable goal but probably unrealistic. It will take more than plain-vanilla reliability to pull ahead in this crowded pack.

Milestone

Digital Marketing Corp.'s $99 *Milestone* admits its limitations right up front, stating its purpose as the planning and tracking of relatively small projects. *Milestone* does not do resource leveling (resolving manpower conflicts); its intended users are people who feel overwhelmed by the PERT and critical-path methods.

Originally developed for CP/M- and Pascal-based systems, *Milestone* runs smoothly in DOS. Its documentation is a neatly bound, succinctly written paperback manual.

Like those in the better-known *Microsoft Project*, *Milestone* commands are executed by typing the first letter of the selected task. And, as in *Microsoft Project*, you need to resist the impulse to press the Return key, which often thrusts you into a black DOS hole. The Tab key gets you through the program.

The similarities to *Microsoft Project* end at the documentation. While Microsoft indoctrinates users with a slick, 2-hour tutorial, the *Milestone* tutorial is three pages of commands that you type in as you follow along, with a line or two about how each command makes the program work.

On one level, this contrast points out a stark difference between the high and the low end. Still, the *Milestone* directions are well chosen, and after reading them you'll know how the program works. If two project management novices were given *Microsoft Project* and *Milestone*, the *Milestone* user would be viewing the first completed Gantt chart by the time the *Microsoft Project* user finished half of the tutorial.

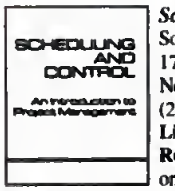
Project Planning & Scheduling

A part of IBM's Personally Developed Software series, *Project Planning & Scheduling* is designed to handle bookkeeping, scheduling, sorting, charting, and report generation. "You will never

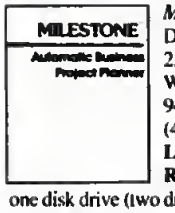
PC MAGAZINE FACT FILE



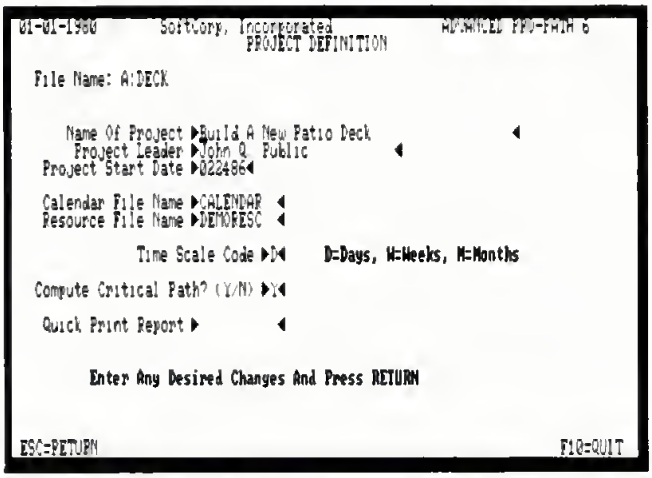
Advanced Pro-Path 6
Softcorp Inc.
2340 State Rd. 580, #244
Clearwater, FL 33575
(813) 799-3984
(800) 255-PLAN
List Price: $199
Requires: 160K RAM, one disk drive.
In Short: A no-frills alternative for creating Gantt charts, with a fine tutorial. Used to be called *Pro-Ject 6*. Not copy protected.
CIRCLE **673** ON READER SERVICE CARD

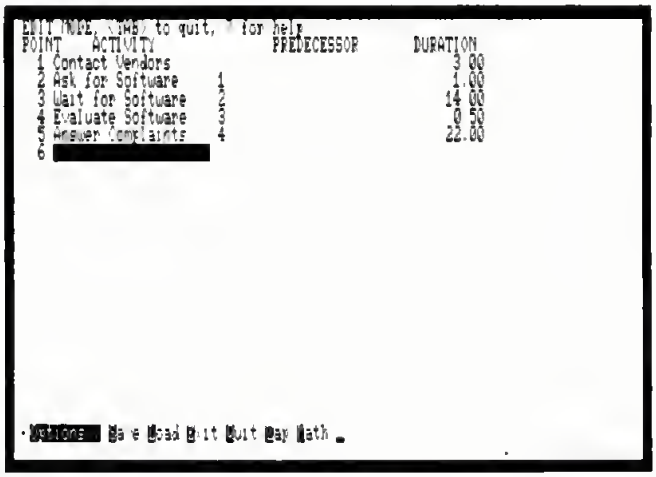


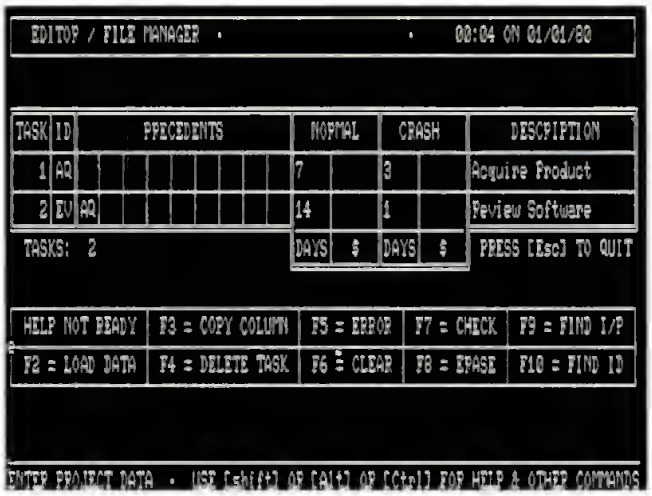
Scheduling and Control
Softext Publishing Co.
17 E. 45th St.
New York, NY 10017
(212) 986-5985
List Price: $95
Requires: 170K RAM, one disk drive, DOS 2.0 or later.
In Short: An inexpensive and easy-to-use solution for Gantt-based project scheduling. Not copy protected.
CIRCLE **674** ON READER SERVICE CARD



Milestone
Digital Marketing Corp.
2363 Boulevard Circle
Walnut Creek, CA 94595
(415) 947-1000
List Price: $99
Requires: 128K RAM, one disk drive (two drives recommended).
In Short: A nicely packaged program aimed at managing small projects. Easy to get up and running quickly. Not copy protected.
CIRCLE **671** ON READER SERVICE CARD







Advanced Pro-Path 6's project definition screen (upper left) prompts you to input the fundamental data. Once you've done so, the information can be output to a table or Gantt chart. Tasks and their predecessors are entered into Softext's Scheduling & Control *input screen (above) for future output into a Gantt chart. IBM Personally Developed Software* Project Planning and Scheduling *(lower left) allows you to make calculations in normal and crash modes, showing two different views of the same project. The layout of the data input screen is a little disorienting: Task IDs are on the left where you'd expect to enter task descriptions, and descriptions are entered at the far right.*

need to construct a critical-path network, figure out nodes and arcs, or invent dummy tasks," the manual boasts. The program "has been designed to relieve you of as much work as possible." This piece of standard project-management rhetoric fails to acknowledge the fact that after the program has drawn its charts, the real work on any project has yet to begin.

Project Planning & Scheduling is based on three interactive modules: an editor/file manager facilitates the entry of project information; the network engine completes calculations; and the project planner assembles and prints schedules and charts. By reading the manual, which is clear and easy to understand, you can gain a working knowledge of the program in minutes.

The opening screen features an input graph and a function key guide. Each task is assigned a two-letter identification code, and when you enter a new task the program also asks for the codes that correspond to the preceding tasks. You can enter two money or time options, reflecting "normal" or "crash" conditions. The screen is well constructed and easy to use, except for the awkward positioning of the task description on the right.

The program's tutorial comprises ten screens of type introducing various aspects of the package. After zipping through these ten screens, you'll have an idea of the program's strengths and weaknesses. For instance, you'll learn that *Planning & Scheduling* can handle 450 tasks, but you'll be warned several times that if you approach that limit, you'll tax the program's capacity.

The program's help screens are downright condescending. While explaining the "precedent" concept, for example, the simple fact that one task precedes another, the screen reads, "An example would be your parents. They are your IMMEDIATE precedents. Your grandparents and ancestors would be DISTANT to you."

Planning & Scheduling lacks a printer/screen toggle: Its default is the printer; tables will only be sent to the screen if your printer is turned off. These tables offer several views of the same information in bar charts and straight data tables, so that you can evaluate the projects in either numerical or graphic form.

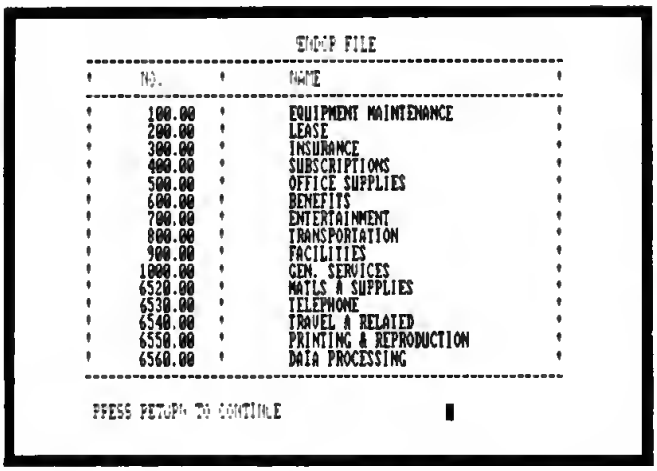
PC MAGAZINE FACT FILE



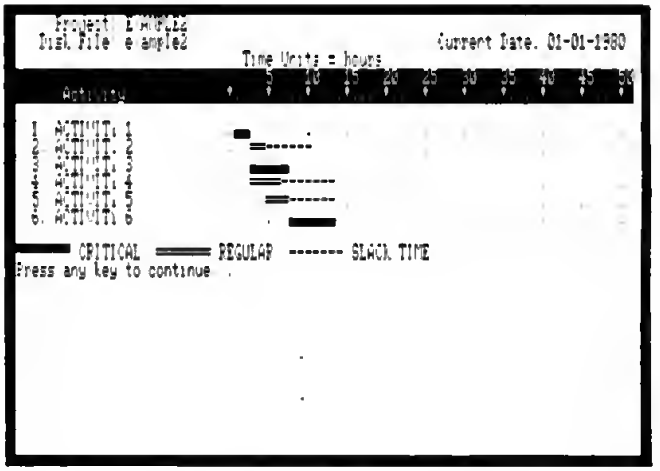
Project Planning & Scheduling
IBM Personally Developed Software
P.O. Box 3280
Wallingford, CT 06490-3280
(800) IBM-PCSW

List Price: $149.95
Requires: 128K RAM, one disk drive, DOS 2.0 or later.
In Short: Designed to help you organize the mundane tasks of project management, this package also offers several graphic perspectives on your data. Not copy protected.

CIRCLE **672** ON READER SERVICE CARD



PC/MIS *is a small-business management program with separate tables for a variety of different functions. Personnel, vendars, and projects can be entered, yielding a complete view of small-business management.*



EasyGANTT *traces the critical path of a project, immediately outputting a Gantt chart after asking for such skeletal details as the name of the task, what precedes it, and how long it will take.*

PC/MIS

PC/MIS from Davis & Associates is not a project manager in the conventional sense. Rather, it is a software system for the management of all aspects of a small business. It tracks projects, time sheets, employees, clients, and expenses, and it lets you add, change, or display any record within those categories. Two levels of password protection keep your data secure.

PC/MIS can generate Gantt charts, but this feature seems to be almost an afterthought. "Many people think that project management is limited to scheduling," says company principal Sidney Davis. "But scheduling is only one portion of it."

Because the program does not focus on scheduling per se, Davis chose not to include PERT capabilities in PC/MIS. The program seeks to define the task itself rather than determine its duration. PC/MIS does not fit precisely under the project management label; it actually includes more features traditionally associated with database managers than those usually found in project managers. Its data entry, analysis, and display functions in particular resemble those of a database manager.

If you're seeking a traditional project management package at a lower price, you should look elsewhere. But on another level, PC/MIS is the proverbial answer to an important unasked question:—how do you automate the paperwork involved in operating a small business?

EasyGANTT

The sole purpose of Morgan Computer Co.'s *EasyGANTT* is to create Gantt charts. Like all project management packages, *EasyGANTT* prompts you for units of time, project tasks, sequences and durations. But instead of giving you several views of the same data, it simply translates these tasks into the Gantt format.

■ *PC/MIS* includes features traditionally associated with database managers.

No one can accuse *EasyGANTT* of using artificial-intelligence techniques. Before you map out a task with this program, you have to think out—or even list—all of the project's activities, along with their order and duration. Still, the program acknowledges its limitations and does not claim to be a full project management system. It would be most effective for people who are most concerned with scheduling the order of events, and they could use it to get a Gantt view of information developed in a spreadsheet, database, or word processor. For these kinds of applications, Morgan computer could increase *EasyGANTT*'s effectiveness by making it memory resident.

Smart software shoppers can always save money by determining exactly what features they need and seeking out a product that does just those tasks, without spending extra for unneeded features. If all you need to do is draw Gantt charts in order to get a quick list of tasks and scheduling, there's no reason to spend more than $49 or look further than *EasyGANTT*. This program does one thing, but it does it with speed and grace.

DATA*EASY Project Scheduler

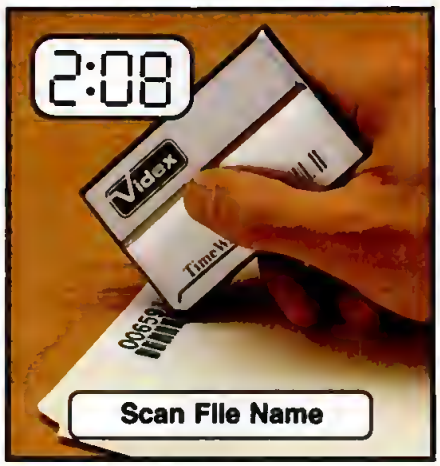
Like *EasyGANTT*, *DATA*EASY Project Scheduler* is a no-frills time-budgeting package. Its charts are the least attractive of the products reviewed, with uppercase letters used to fill out the Gantt field.

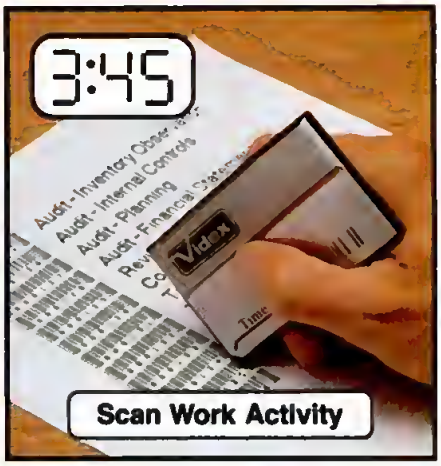
Pretty, however, doesn't mean squat in low-cost scheduling. Its graphics may not be presentation quality, but *Project Scheduler* is an efficient package. One very useful feature is its ability to display two different Gantt charts on the screen at the same time.

This menu-driven program has "low budget" written all over it. The somewhat confusing manual consists of about 20 loose pages stuffed into a plastic slipcase, and there is no formal tutorial. Company

TimeWand™ - Keeping track of time...

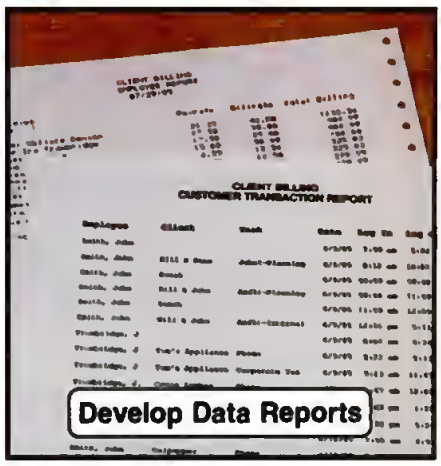












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The Videx TimeWand™ is an intelligent yet inexpensive bar code system for your business needs. Small enough to fit easily into a shirt pocket and weighing in at less than two ounces, TimeWand gives a new dimension to the concept of fully portable bar code readers.

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Available in three different memory configurations, TimeWand can store from 2,000 to 16,000 characters in its internal memory. This means you can hold from a few hundred to a few thousand bar codes in the TimeWand before transferring the information to a host computer system.

TimeWand time-stamps *each* bar code as it's read. This lets you know not only what the bar code says, but *when* the code was read.

The TimeWand's recharging/download station uses a standard RS232C serial connector that allows you to communicate with the wand through a variety of host computer systems. Since the communication is keyless, the scan information is sent quickly and error free. Currently, software packages are available for the IBM PC (and compatibles), Apple //, and Apple Macintosh personal computers.

Put the power of TimeWand in your own hands... and let it work for you.

TimeWand (2K version) - $198
Recharger - $149
TimeWand Manager Software (Macintosh) - $499
TimeWand Communications Software (IBM) - $299

Videx

1105 N.E. Circle Blvd., Corvallis, OR 97330
503-758-0521

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PC MAGAZINE FACT FILE



PC/MIS
Davis & Associates
1655 Peachtree St., #1007
Atlanta, GA 30309
(404) 875-0793
List Price: $69 plus $6 shipping and handling
Requires: 64K RAM, two disk drives, DOS 2.0 or later.
In Short: *PC/MIS* can generate Gantt charts, but its primary role is to organize all of the aspects of running a small business. Not copy protected.

CIRCLE 669 ON READER SERVICE CARD



EasyGANTT
Morgan Computing Co. Inc.
P.O. Box 112730
Carrollton, TX 75011
(214) 245-4763
List Price: $49
Requires: 128K RAM, two disk drives, DOS 2.0 or later.
In Short: *EasyGANTT* excels at Gantt chart generation and makes no claims to handle other project management chores. Not copy protected.

CIRCLE 670 ON READER SERVICE CARD



DATA*EASY Project Scheduler
Data Consulting Group
12 Skylark Dr. #18
Larkspur, CA 94939
(415) 927-0990
List Price: $78
Requires: 64K RAM, one disk drive, DOS 2.0 or later (DOS 1.1 on request).
In Short: *Project Scheduler*'s capabilities make it a model of low-end efficiency. Not copy protected.

CIRCLE 667 ON READER SERVICE CARD



Project Management IBM
Institute of Industrial Engineers
25 Technology Park/Atlanta
Norcross, GA 30092
(404) 449-0490
List Price: $175
Requires: 48K RAM, two disk drives, DOS 2.0 or later.
In Short: A package that gracefully accomplishes its one goal: to serve users who need to generate PERT data but don't need PERT charts. Not copy protected.

CIRCLE 668 ON READER SERVICE CARD

SELF-IMPROVEMENT IN THE MAJOR LEAGUES

The makers of the high-end market leaders in project management aren't waiting around for their low-cost competitors to catch up. Five have recently added new capabilities to their programs.

As demand for lower-end project management software grows, the major players in the PC market (see "Project Management Software: The Top Sellers," *PC Magazine*, Volume 5 Number 3) aren't standing still. Five have recently released major upgrades.

Microsoft Project (Microsoft Corp., Bellevue, Wash.) has undergone the most drastic renovation. Version 2.0 incorporates PERT chart capability, increased time increments, subproject linking, and increased report capacity. To facilitate these changes, the program was rewritten in C, and its RAM requirement has doubled to 256K. Microsoft has raised *Project's* price from $250 to $395 and has dropped copy protection.

SuperProject Plus (Computer Associates, San Jose, Calif.) replaces *SuperProject*, adding deadline-scheduling options, enhanced multiple task and time relationships, and an enhanced resource calendar. The program's resource-leveling capabilities have also been greatly expanded, and the price has been raised from $100 to $495.

The *Harvard Total Project Manager*, Version 1.1. (Software Publishing Corp., Mountain View, Calif.), upgraded from Version 1.0B, has enhanced subproject capabilities, faster printing, and a greater potential number of reports. Software Publishing has added support for several new printers while holding the price at $495.

The *Project Manager Workbench* (Applied Business Technology Corp., New York, N.Y.) now includes a target end feature, along with the ability to schedule a task that begins when another is 80 percent finished. Resources can also be adjusted, and charts can be redesigned from straight Gantt or PERT formats to suit the whims of the individual manager. The $1,150 program (the price is unchanged) is now supporting three networks: IBM's PC Net, Novell, and DNA. While the *Project Manager Workbench* is still copy protected, hard disk installation is now possible.

The price and version number of *Timeline* (Breakthrough Software, Novato, Calif.) are unchanged, but Breakthrough has added file-import capabilities and training options. It now can import files from such programs as Living Videotext's *Ready!*, *dBASE II and III*, *1-2-3*, *WordStar*, and *MultiMate*. These facilities are included in new *Timeline* releases, or users can download them from Breakthrough's bulletin board, (415) 892-0408.

—Charles Bermant

president Kip Koehler acknowledges that the product is unspectacular, a plain-vanilla scheduling program that he continues to manufacture for a good reason: it continues to sell.

Project Management IBM

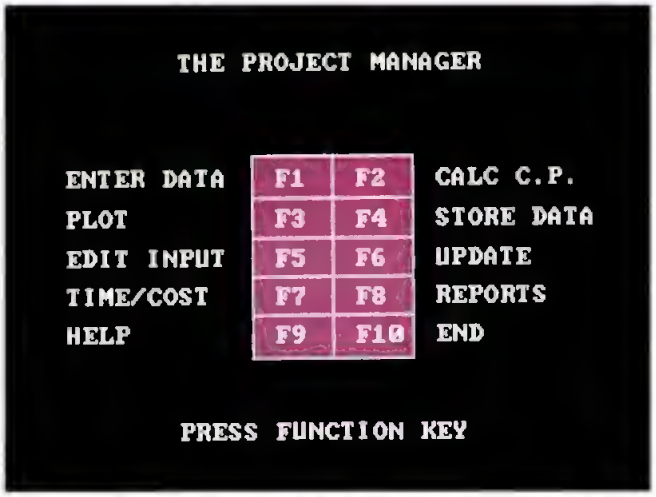
At $175, the Institute of Industrial Engineers' *Project Management IBM* deglamourizes the project management concept. This BASIC program is not a package for beginners who need hand-holding or for thrill-seekers who want to turn their project data into jazzy output.

This doesn't mean that it's a program for programmers. A short manual lists all the commands you need to make the program work. Still, you need a working knowledge of BASIC to make this program run smoothly. For instance, to open a

Project Management Software: Summary of Features

Product name/ Manufacturer	List price	Copy protected	Number of tasks per project	Number of resources per project	Number of resources per task	Schedule units	Maximum calendar length	Gantt chart capability	PERT chart capability
EasyGANTT/ Morgan Computing Co.	$49.00	No	80 events; 3,160 activities	N/A	N/A	Minutes to months	Unlimited	Yes	No
PC/MIS/ Davis & Associates	$69.00	No	44	Unlimited	Unlimited	Week/month	24 periods (up to 2 years)	Yes	No
DATA*EASY Project Scheduler/ Data Consulting Group	$78.00	No	Unlimited IDs	1 per day	1 per day	Minutes/days/ range of days/ year	Approx. 30 years	Yes	No
Scheduling and Control/ Softext Publishing Co.	$95.00	No	49 activities	2	2	User-defined (any unit of 1)	N/A	Yes	Yes
Milestone/ Digital Marketing Corp.	$99.00	No	350	9	9	Hours/days/weeks/ months/years/ fiscal years	Unlimited	Yes	No
The Project Manager/ Wiley Professional Software	$125.00	Yes	400	N/A	N/A	In fractions of days	1 year	Yes	No
Project Planning & Scheduling/ IBM Personally Developed Software	$149.95	No	450	N/A	N/A	Days/weeks	9 years for scheduling, 6.5 years for charting	Yes	No
Project Management IBM/Institute of Industrial Engineers	$175.00	No	500	4 with *Resource*	4 with *Resource*	User-defined	N/A	No	Yes
Advanced Pro-Path 6/ Softcorp	$199.00	No	250	60	5	From fractional days to months	10 years	Yes	No

N/A = not applicable



The Project Manager's *function-key-based opening screen is reminiscent of other low-end project management packages. The rest of the program's screens have even fewer visual frills.*

file you type LOAD "C:FILE" followed by RUN. The format may cause some confusion among BASIC-illit-erate PCusers, who are likely to invoke a nasty "redo from start" message.

Project Management IBM is actually intended for managers and engineers who rely on PERT data for project control. If you choose the PERT option, you are asked to list the project number, along with the numbers of the tasks it follows and precedes. This program manipulates and outputs PERT data without the use of PERT charts. It doesn't print charts or allow project names; rather, it outputs a series of tables containing time variance and project duration data using a reference number for each task.

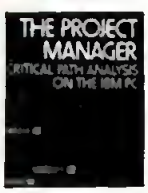
Like *EasyGANTT*, *Project Management IBM* performs one task—outputting PERT data—powerfully and efficiently. But the program is on the opposite end of the scale when it comes to ease of use.

The Project Manager

Wiley Professional Software's *The Project Manager*, like *Project Management IBM*, is a BASIC-resident program that requires a lot of planning before you start it up. But *The Project Manager* soups up *Project Management IBM*'s basic concept by adding a function key menu, the ability to generate Gantt charts along with PERT data, a quick critical-path output, and color/graphics capabilities.

Despite its low price tag, *The Project Manager* is not a low-end product. It is a

FACT FILE



The Project Manager
Wiley Professional Software
605 Third Ave.
New York, NY 10158
(212) 850-6009
List Price: $125
Requires: 128K RAM, one disk drive. For hard copy, use the HP 7470A or 7475A plotter and asynch communications adapter or a graphics matrix printer.
In Short: Powerful and difficult to master. *The Project Manager*'s low price belies its wealth of useful features, such as PERT data generation. Copy protected.

CIRCLE 666 ON READER SERVICE CARD

data organizer and generator. With a complicated, multitask project, you could spend more time off the computer than on, gathering the data and writing out worksheets. It is also not a program for beginners; its tutorial only involves entering sample data, and its screens and printouts are simple and unpretentious.

The Project Manager might take some getting used to, especially if you've used any of the simpler packages previously discussed, but it is a good choice if you are willing to sacrifice simplicity for power.

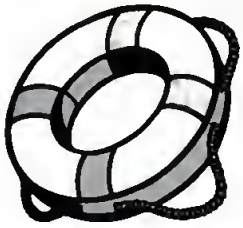
EDITOR'S CHOICE

Softext's ***Scheduling and Control*** *offers the most traditional project management tools with the best price/performance ratio. Its tutorial not only helps you learn the program but offers a basic course in project management as well. The program is the easiest of the bunch to get up and running.*

Of the unconventional packages, ***PC/MIS*** *has the most potential. It is a true productivity tool for people who want their whole business—not just one project—to run more efficiently.*

You know I can rescue your data.

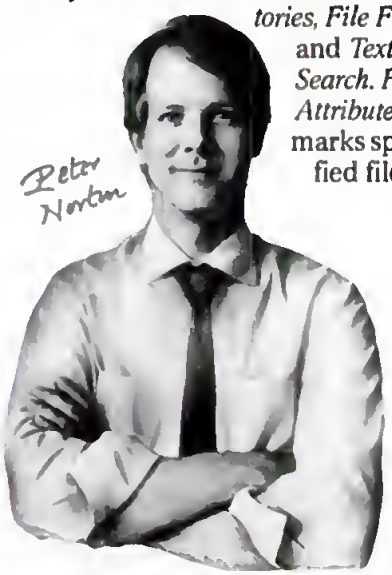
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Other utilities measure available file space, test your disk for damage, and measure your computer's performance. *PC Magazine* calls The Utilities "Indispensable." *The New York Times* says "Don't compute without it." Peter McWilliams (*The Personal Computer Book*) says "You'll bless this disk." Dozens of features keep your data in line. Every day.

The Norton Utilities. Designed for the IBM® PC, PC-AT, and DOS compatibles. Available at Computerland and most software dealers. Order direct for $99.95 from Peter Norton Computing, Inc., 2210 Wilshire Boulevard, Santa Monica, CA 90403. 213-453-2361. Visa and Mastercard welcome.

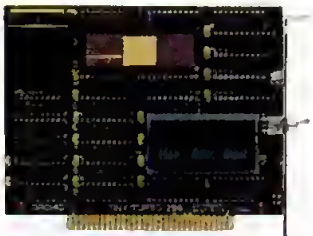
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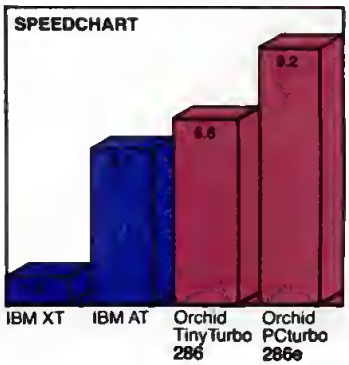
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MENU GENERATORS: DOS Made Easier

Menu generators are one category of DOS utilities that may make PCs easier to use for everyone in your office. But setting them up properly can take work.

To many people, DOS is an impenetrable mystery they have little desire to solve. Clerical workers who want only to find the word processing program in a hard disk's subdirectory maze or engineers who just want to quickly get to the CAD drawing of the part you've requested could both benefit from a utility that makes program access simpler.

Menuing software is one way companies can ease the pain. These programs, which create menus of applications and DOS commands, are hard disk utilities, a category that also includes extended DOS services programs, file-backup utilities, and path utilities. *PC Magazine* covered extended DOS services in Volume 5 Number 9. We'll treat the latter two categories in future issues.

Menu generators have one main purpose: creating an easy-to-use interface that spares you the enigma of the DOS prompt. The benefits to novices of a DOS shell are obvious: menus are simply easier to learn than command structures. You still need to understand how to copy files and format disks, but any step that eliminates the need to memorize the arcane syntax of DOS commands shortens the learning curve. The eventual payoffs are fewer keystrokes and increased productivity.

Menu generators also help you standardize the interface throughout your company's PCs. Such an interface lets anyone easily find and use applications on any similarly configured machine. If the menu generator program includes a security feature, you can create a password system to restrict access to certain programs. Finally, with some menu systems, you can maintain a usage report for internal or external billing purposes.

FAMILY FEATURES All of the programs reviewed here share certain common features. They all permit one- or two-keystroke access to your applications. Virtually all of them come with a menu maintenance utility and some DOS commands, such as FORMAT and COPY, already configured. Many of them also offer security programs, so that only authorized individuals can access sensitive files. Finally, most of them allow you to exit temporarily into DOS to perform operations that are too cumbersome or impossible to do from within the menu shell, like installing new programs.

A few of these programs offer even more. MicroConcept's *The Master Menu* comes with a notepad and a calendar, and ModTech's *Hard Desk* has a cut-and-paste facility so that you can swap data between programs. XTC Software's *DOSshell* has a way to hide and reveal files.

While features vary from program to program, some features—such as an easy flow between menus, submenus, and application programs—are essential. A menu generator should also permit the passing of parameters; otherwise you'll have to write an endless number of self-contained batch files to cover every contin-

gency. Other features, such as security and usage tracking, while not essential, may be highly desirable.

Security is a primary selling point for many of these programs. While many sport security systems, you should realize that none of them are actually fail-safe if someone is determined to tamper. True, they allow you to set up passwords for accessing menus, programs, and DOS functions, and they all prevent you from defeating security from within the program by hitting Ctrl-Break. But most cannot prevent you from circumventing the AUTOEXEC.BAT file during boot-up. And even K-Qual's *Menu Manager*, which sets security levels with a device driver in the CONFIG.SYS file, cannot prevent you from booting the system with a floppy disk, completely bypassing the menus and their security parameters.

Requiring passwords to access is an inconvenience, as well. Entering passwords takes time, causes frustrations when someone legitimately forgets the password, and eventually might cut down on the productivity you were trying to gain by buying a DOS shell in the first place. In any case, your employees will eventually learn enough about DOS to easily circumvent the password system.

A BOON TO SUPERVISORS For a supervisor, perhaps the most important feature of a menu generator will be its facility for tracking computer use. Programs that have a reporting feature, like Delta Technology International's *direct access* and DeereSoft's *Magic Menu*, supply information on the users, project numbers, and audit classifications. Such data enables you to bill your clients for actual time spent during development or processing and gives you some idea of how much time you're spending using various applications. As useful a feature as this is, it is surprising to see that the majority of programs tested could not keep a system log. Only The Aldridge Company's *PreCursor* attempts to address this need, by displaying the time spent in an application on-screen. Even *PreCursor*, however, leaves the job of actually recording the data to you.

Before you rush out and purchase a menu generator for each of your workstations, remember that these programs do not install themselves: someone with a fair degree of technical expertise must set up the menu initially. In some cases, the task is simply a matter of filling in a filename and any needed parameters. In other cases, menu installation requires a fairly extensive working knowledge of DOS, its commands, and its batch facilities. In the most difficult scenario, it requires learning a new language. Unfortunately, most of the programs in this project fall into the second category. *PreCursor* was the only program capable of finding a program's path all by itself.

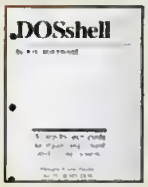
These programs make life difficult for the system installer in other areas, too. For example, none of the reviewed programs allow you to look at your hard disk directory or tree listing during menu maintenance, and so you may need a hard copy of your disk's tree structure alongside you as you define your menus. *Magic Menu* and a few other programs allow you to print out your menu configurations, but not as a part of menu maintenance.

■ While many menu generators sport security systems, none of them are actually fail-safe if someone is determined to tamper.

You are not always allowed to design your menus as you would like, either. K-Qual's *Menu Manager*, for example, forces you to enter your submenus into its predefined main menu. Others, like *The Master Menu*, only allow one path per submenu; thus, if you have two word processors in different directories, you need different menus to access them.

The installation process for some of these programs can be quirky. In addition to altering or replacing your AUTOEXEC.BAT or CONFIG.SYS files, some programs insist on being in the root directory (*System Manager*) or in the same directory

PC MAGAZINE FACT FILE



***DOSshell*, Version 1.0**
XTC Software
789 Casiano Dr.
Santa Barbara, CA
93105
(805) 687-0865
(805) 964-2480
List Price: $25.00
Requires: 64K RAM, DOS 2.0 or later.
In Short: *DOSshell*'s shell is little more than a series of small batch files. Its manual, however, is an excellent guide to the DOS batch processor.
CIRCLE **607** ON READER SERVICE CARD



***System Manager*, Version 3.0**
Business Management, Systems Inc.
9526-A Lee Hwy.
Fairfax, VA 22031
(703) 591-0911
List Price: $99.00
Requires: 128K RAM, DOS 2.0 or later.
In Short: *System Manager*'s menu is limited but serviceable. It includes an OK macro facility. However, it also includes some annoying quirks.
CIRCLE **606** ON READER SERVICE CARD



***Fixed Disk Organizer*, Version 1.0**
IBM Entry Systems Division
(available through IBM Product Centers and authorized dealers)
List Price: $55.00
Requires: 128K RAM, DOS 2.0 or later.
In Short: An old favorite that still works well for users who don't have to access more than its 45-program limit. Easy to install and use.
CIRCLE **605** ON READER SERVICE CARD



***Hard Desk*, Version 1.0**
ModTech
10933 Crabapple Rd.
Roswell, GA 30075
(800) 223-6250
List Price: $95.00
Requires: 128K RAM, DOS 2.0 or later.
In Short: *Hard Desk* has more features than most of these programs, and most of them work well. It is easy to install and use but suffers from a 15-entry limit.
CIRCLE **604** ON READER SERVICE CARD

as the DOS programs (*Le Menu* and *System Manager*). Even then the utilities, such as editors and notepads, tend to be something like Trojan horses; *DOSshell* and *Le Menu*, for example, use DOS's EDLIN as the default editor for their utilities. While many praise EDLIN's usefulness, equal numbers deplore its unfriendliness. And who wants to be told what editor to use?

In spite of these drawbacks, menu systems can make computer use easier and more efficient. Or, to put it another way, while some people won't buy a PC until it can brew a cup of coffee, the rest are happily using menus.

TESTING THE MENUS To test ease of use and functionality, we created menus to access *1-2-3*, *WordStar*, *dBASE III* and *R:base 5000*, various DOS commands, and a batch file. The batch file was located in the root directory and called another batch file in a subdirectory, which then ran IBM's sample BASIC music program. All of the programs were tested on a 640K-byte IBM PC with a Datazone Hang20, 20-megabyte hard disk card.

Most of the programs had difficulty running the batch file until it was rewritten to return control to the menu program after execution. Only one program (*Hard Desk*) could not regain control, partly because it changed the music program's display mode from 40-character mode to 80-character mode.

While menu generators permit you to execute DOS commands, none of them allow you to move files or, in most cases, alter attributes. If such features are desirable, you would do better with a program like *PathMinder* or *Direc-Tree* (see Volume 5 Issue 9). Both allow you to maintain files as well as menus. Of the two, *Direc-Tree* is the easier to learn and use. It does, however, have the distinct disadvantage of being copy-protected. In its favor, *PathMinder* requires less overhead (4K of RAM) when executing a file and offers more features than you may know what to do with. Of course, if you are looking for the ultimate in menu capability, power, and flexibility, take a look at *DESQview* (see "Operating in a New Environment," *PC Magazine*, Volume 5 Issue 4) or one of the other alternative operating systems.

DOSSHELL

XTC Software's *DOSshell* creates menus the same way an experienced DOS user would: with batch files. When you choose 1 from the menu, for example, it accesses a file called 1.bat. The problem with this approach is that your disk becomes filled with little batch files that do little more than call other batch files. On the plus side, it still leaves you ready access to the DOS command prompt.

DOSshell comes with a few "utilities" for writing notes and appointments, but they use EDLIN as a text editor. And, while the batch file tells you how to initiate editing, it does not tell you how to exit. The included color program allows you to set foreground and background colors. However, the colors disappear when you exit most programs and appear only when you return to the *DOSshell* menu.

DOSshell may not meet your needs as a menu generator, but it does distinguish itself in one other area: its manual is one of the best texts for batch programming I've seen.

SYSTEM MANAGER

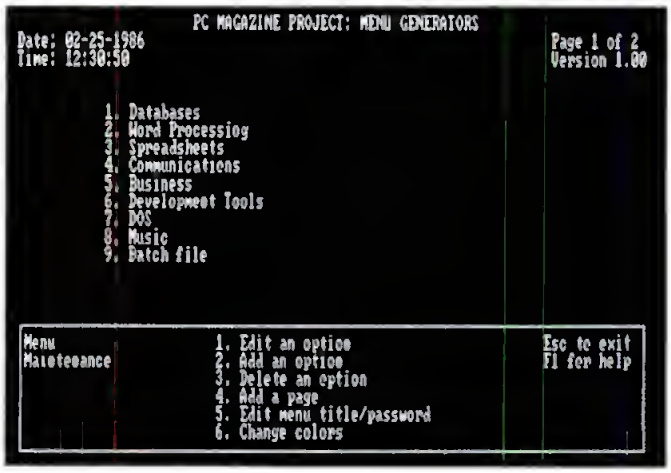
Business Management Systems' *System Manager* couldn't be more inelegant if its spaghetti code were grated directly onto the hard disk's platters. Not only does its installation program copy all of the program's files into your hard disk's root directory, but it also insists on copying all of DOS's files there. As a bonus, the program overwrites your AUTOEXEC.BAT and replaces it with its own. On the plus side, *System Manager* makes use of your system clock and includes a macro facility.

System Manager comes with two screens: an application screen and a utility screen. Both screens combined can hold 52 entries, but 32 entries are predefined, so you are confined to defining 20. If you find the limit restrictive, the manual suggests creating subdirectories for each user and copying the complete program (and presumably DOS) into each. Overall, you can probably design a better system by sticking Post-Its all over the screen.

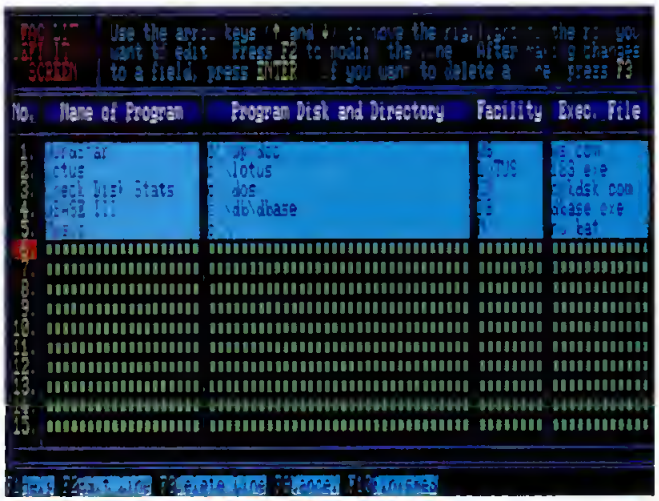
FIXED DISK ORGANIZER

IBM's *Fixed Disk Organizer* was one of the first menu generators on the market, and it is still a viable choice for people who do not need to access more than 45 programs. As it's configured, it makes a DOS command selection available in all menus. DOS commands can be strung together so that you can have a single menu selection that executes over 50 commands consecutively. The maintenance menu pops in, thus leaving the actual menu on-screen for reference.

During the batch file test, I had to rewrite the batch file so that *Fixed Disk Organizer* could regain control. On the whole, the program is extremely easy to use, and I installed and created menus without referring to the manual. The program is even courteous: while it does rewrite your AUTOEXEC.BAT file, it saves your original under a different name (APPLEXEC).



IBM's Fixed Disk Organizer *allows access to 45 programs and lets you string up to 50 DOS commands together for consecutive execution.*



Hard Desk *provides you with menus, macros, and more. When you make a selection,* Hard Desk *automatically paths to the correct subdirectory.*



K-Qual's Menu Manager *puts its security file in CONFIG.SYS. Menu data can be printed to printer, disk, or screen.*

HARD DESK

ModTech's *Hard Desk* may not be perfect, but it is one of the most useful programs in this category. In addition to menus, *Hard Desk* provides a file manager, a macro facility, and a cut-and-paste facility.

Creating a menu involves listing the description, the filename, the path, and the "facility"—*Hard Desk*'s internal label for the executable file. When you execute a menu selection, you are brought to a listing of the appropriate subdirectory from which you can highlight a filename as a parameter or route it to another facility for further processing. In addition, you can add descriptive comments alongside your filenames in the directory listing.

Hard Desk did display one quirk: it crashed after executing the test batch file. When it tried to return, the screen performed a discothèque light show and refused to calm down. Other drawbacks include a 15-entry limit and no usage reporting. Even so, I recommend *Hard Desk* to anyone who needs menus and the ability to swap data between programs.

HARD DISK MANAGEMENT SYSTEM

With *Hard Disk Management System*, you get what you pay for. For a mere $19.95, this no-frills menu generator offers little more than the ability to group 18 applications and/or DOS commands under one screen. Since it makes no attempt to provide security, it has no passwords. By the same token, you cannot compile a usage report of any type unless you yourself create a batch file that generates one.

The program saves keystrokes in the buffer and then executes them at the main menu. Also, when you execute a DIR or CHKDSK command from the DOS utility, be sure you have one of those automatic, superfast screen cameras ready or your finger on ScrollLock because the display scrolls by at warp speed, and, without pause, returns to the main menu.

Configuring the menu consists of writing a description and entering the program name, its drive, and its path. Menu choices can be deleted, but the space they originally occupied in the menu remains empty.

MENU MANAGER (K-QUAL SYSTEMS CONSULTING)

You had better love the opening menu screen of K-Qual Systems Consulting's *Menu Manager*, because you're stuck with it. While most menu generators permit you to define your own menus, K-Qual has decided it knows best.

Because it uses a security file in the CONFIG.SYS file, *Menu Manager*'s security is not as easily broken as that of other programs. If you don't hit the Ctrl-C before the system reads the configuration file, you're faced with the password. However, nothing prevents you from booting from a floppy.

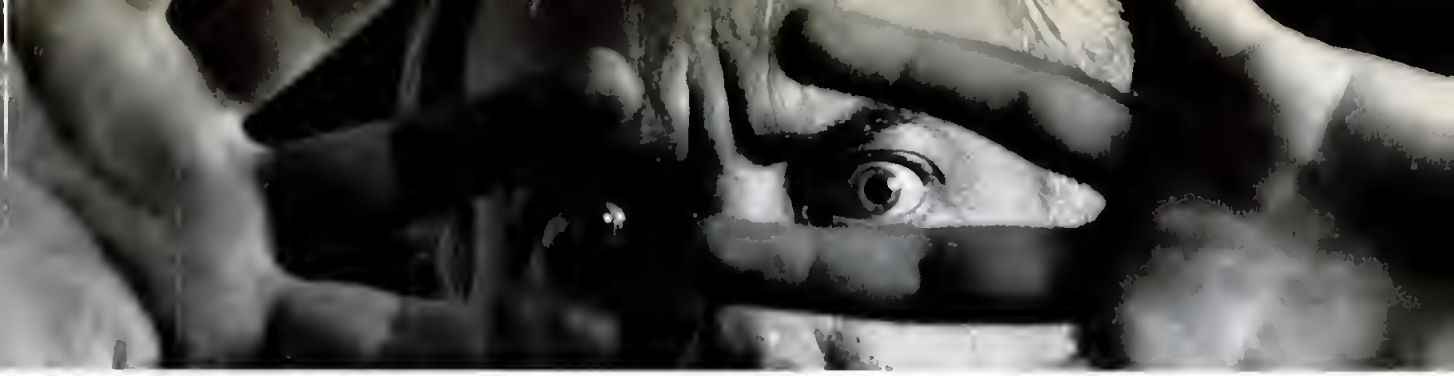
To create a menu choice, you enter the maintenance area, select a category, such as business, from the main menu, and add your selection to that category's submenu screen. Menu information can be printed to screen, printer, or file.

LE MENU

DOS Appetizers, Directory Desserts, The Main Course—makes your mouth water for *Le Menu*? Well, go ahead; it may not be the tastiest morsel in this project, but it is far from unpalatable.

Le Menu offers a number of very nice features, such as file encryption (a more secure form of security) and tagging for multiple file operations. Also, during menu maintenance, *Le Menu* checks to see if the programs are in the named subdirectory. If not, it asks you where the programs are, and then copies them to the new subdirectory. If the requested program is in the subdirectory, but you simply forgot its extension, *Le Menu* will attempt to copy the program onto itself.

Le Menu's biggest drawback is that it insists on copying all of the DOS programs



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***Hard Disk Management System*, Version 1.0**
Global Technologies Corp.
16572 East Louisiana Dr.
Aurora, CO 80017
(303) 337-7758
List Price: $19.95
Requires: 256K RAM, DOS 2.0 or later.
In Short: *HDMS* is an inexpensive menu generator with no frills; it may not satisfy your needs, but it doesn't cost a lot to find out if it does or not.
CIRCLE **603** ON READER SERVICE CARD



***Menu Manager*, Version 1.1**
K-Qual Systems Consulting
71 Archwood Ave.
Staten Island, NY 10312
(718) 948-0266
List Price: $49.95; with Boot Security, $59.95; with Boot Security and Turbo Pascal source code, $79.95
Requires: 64K RAM, DOS 2.0 or later.
In Short: K-Qual's *Menu Manager* would be more acceptable if it weren't for its fixed main-menu screen and its dot matrix–printed manual.
CIRCLE **602** ON READER SERVICE CARD



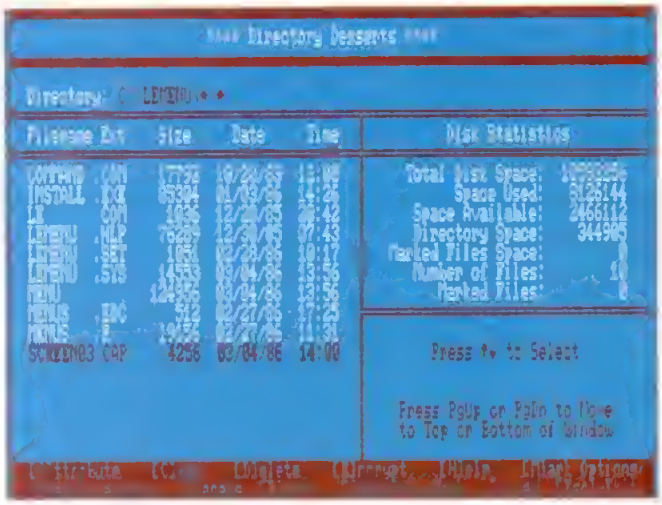
***Le Menu*, Version 1.4**
Bartel Computer Systems
1275 Fort Union Blvd.
Midvale, Utah 84047
(801) 566-5544
List Price: $59.95
Requires: 256K RAM, DOS 2.1 or later.
In Short: A powerful program with a lot of nice features, including file encryption and multiple-file operations. However, *LeMenu* also replaces your AUTOEXEC.BAT file with its own and copies all DOS programs into its own subdirectory.
CIRCLE **601** ON READER SERVICE CARD



***Magic Menu*, Version 2.0**
DeereSoft Inc.
P.O. Box 1360
Melbourne, FL 32901
(305) 768-2477
List Price: $99.00
Requires: 128K RAM, DOS 2.0 or later.
In Short: *Magic Menu* offers more utility than most programs, but its enhanced power makes it difficult to set up.
CIRCLE **605** ON READER SERVICE CARD

into its own subdirectory during installation. *Le Menu* will also replace your AUTOEXEC.BAT's PATH command with its own. As a result of this unruly conduct, my system clock would not run. While the latter annoyance is common practice among these products, the former is simply a case of bad implementation.

If *Le Menu* were as sharp as its manual is chic, it would be one of the best programs going.



Among its other offerings, Le Menu *features file encryption and tagging for multiple-file operations.*

MAGIC MENU

While most menu-generator packages can be installed and set up with a minimum of effort, *Magic Menu* requires some work. In fact, it is probably the only package I reviewed whose documentation and tutorial may be required coursework. However, this effort is well spent. For your time and patience, you get a fairly comprehensive and powerful menu system that makes operations zip along as though they were executed from the DOS prompt.

My complaints have more to do with the package's overall modular design than with its actual performance. There may be some justification for having separate configuration, user, and audit programs, but I am not excessively happy about using an external editor to modify a program's files. Nor am I thrilled to see a 40-character display mode as the default—it makes me think the program is constructed sloppily, which it is not.

In spite of these drawbacks, *Magic Menu* is one of the better menu generators I reviewed. It gives you control over virtually every aspect of your menu system, from the display mode to where the screen definition files reside. It also allows you to output character strings to your printer or modem, produce an audit trail, set up a sequence of commands (including prompts for key disks), and declare fixed and dynamic variables.

Nope, *Magic Menu* is not magic; it's just hard work that delivers.

THE MASTER MENU

MicroConcepts' *The Master Menu* is the only copy-protected program in this survey. It offers password security, a usage report, a DOS interface utility, a notepad, a calendar, and a batch-file editor.

While *The Master Menu* is easy to use once set up, its overall design leaves much to be desired. For example, the manual suggests circumventing its one-path-per-menu limitation by writing batch files to change directories and call other programs. I thought that's what menu-generators were for. Also, the program has a tendency to scroll uncontrollably during listings; the usage report rolls by much faster than you can read it, and DOS directory listings slip by quickly without pause as control is automatically returned to the program.

PC MENU

PC Menu gives you complete control over menu-screen design; the only program in this survey that does. It is also the only generator that requires you to write a program with declarations, procedures, call statements, and subroutines. You accom-

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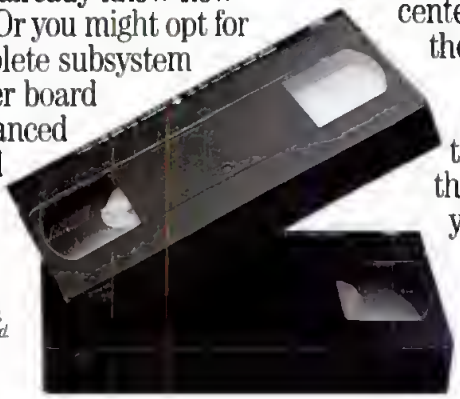


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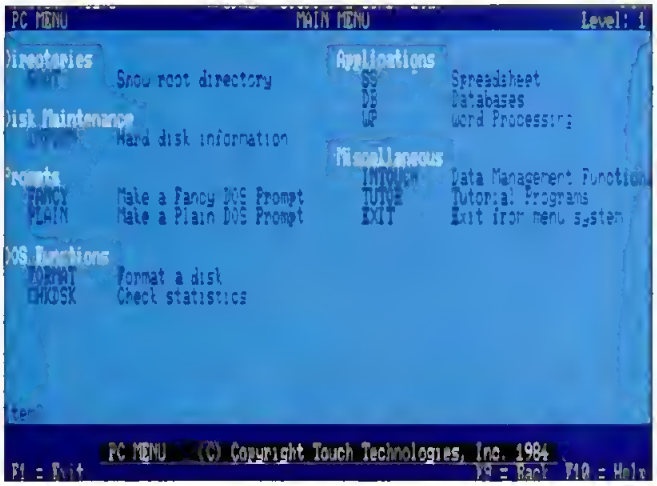
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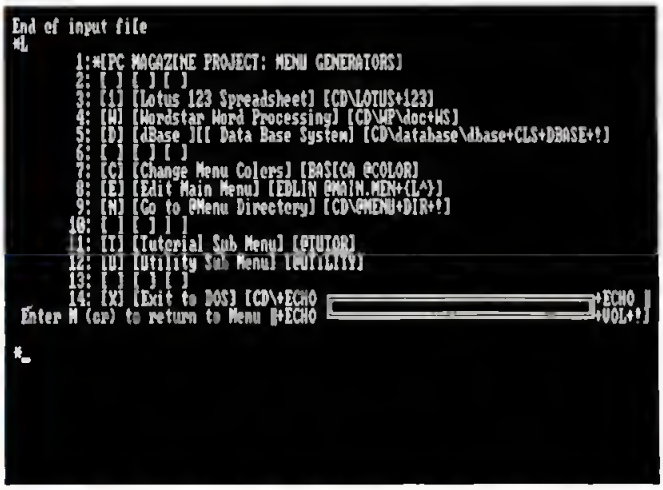


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CIRCLE 102 ON READER SERVICE CARD



PC Menu *includes a procedural language and gives you complete control over screen design. It comes with an external text editor.*



Cottage Industries' Menu System *comes with predesigned menus that you can edit with any ASCII text editor, and it allows easy access to DOS.*

plish menu selection by typing in the minimum number of keystrokes to identify that selection and then entering the choice.

The language includes such commands as $Item for an entry listing, $Help for on-screen messages, and $Batch for batch files. *PC Menu* comes with an external editor that supports rudimentary graphics. The documentation is more of a programmer's manual than a product description. While such a design allows for flexibility, it isn't too easy for the novice.

MENU SYSTEM

Cottage Industries' *Menu System* comes with a number of predefined menus and a 26-page manual. To design menus you use EDLIN or another ASCII word processor. Each menu screen is saved in its own file and consists of three sections: one for selection letters, one for descriptions, and one for the commands necessary to bring the program on-screen. Menu commands can include fixed and dynamic variables, text messages, and DOS commands.

Menu System may not be as powerful or as flexible as some of the other programs, but it is one of the most polite. For example, during installation, it saves your original AUTOEXEC.BAT file with the extension .OLD. It also allows you easy access to DOS.

At $49.95, *Menu System* is inexpensive enough to purchase for evaluation purposes, and it may fit your needs.

MENU MANAGER (PHOENIX SYSTEMS)

Phoenix Systems' *Menu Manager* is a winner. Its menus are simple to design and it offers some nice features. During installation, *Menu Manager* was the only program to display AUTOEXEC.BAT's path description for editing. It lacks on-line help at the main menu, but, then again, no help is needed.

The main menu consists of two nested boxes that change with each selection. You make selections by highlighting and entering the desired application; the last selection on a menu must be to exit to either a higher menu or to the operating system. You define the menus themselves in two screens. The first allows you to add, delete, or move choices, define passwords, and select options. In the second screen, you enter the description and either the submenu to call or the path and commands for executing the program.

Menu Manager includes a file manager that provides DOS functions, locates files, and allows you to tag files for further processing. It has commands for prompting the user and accepting yes/no answers.

Phoenix's *Menu Manager* may not offer an audit trail and its password system may be as flimsy as everyone else's, but it is an easy program with which to develop effective menus and select applications.

TOC I

TOC's *TOC I* is an inexpensive menu generator that has features usually found only



TOC I *lets you include parameters, pauses, and passwords with your menu selections. You select menu choices with function keys.*

PC MAGAZINE FACT FILE



***The Master Menu*, Version 1.0**
MicroConcepts Inc.
4307 Arden Dr.
Ft. Wayne, IN 46804
(219) 432-8088
List Price: $142.50
Requires: 192K RAM, DOS 2.0 or later.
In Short: *The Master Menu* has many problems and few virtues. It is copy-protected, asks the user to do work that the program should be doing, and interacts poorly with DOS.

CIRCLE **550** ON READER SERVICE CARD



***PC Menu*, Version 2.1**
Touch Technologies
609 S. Escondido Blvd., #101
Escondido, CA 92025
(619) 743-0494
List Price: $139.95
Requires: 256K RAM, DOS 2.0 or later.
In Short: With *PC Menu* you get a language for menu generation that gives you flexibility in screen design.

CIRCLE **549** ON READER SERVICE CARD



***Menu System*, Version 3.0**
Cottage Industries Inc.
P.O. Box 176
Liberty, MO 64068
(816) 221-8088
List Price: $49.95
Requires: 64K RAM, DOS 2.0 or later.
In Short: *Menu System* is a simple-to-use, relatively easy-to-design-with menu generator that offers some nice features.

CIRCLE **548** ON READER SERVICE CARD



***Menu Manager*, Version 2.0**
Phoenix Systems Inc.
668 51st St.
Sacramento, CA 95819
(916) 731-8224
List Price: $75.00
Requires: 128K RAM, DOS 2.0 or later.
In Short: Phoenix Systems' *Menu Manager* offers enough menus for 1,000 entries, a file manager, and ease in design and use—an excellent program.

CIRCLE **547** ON READER SERVICE CARD

in more expensive programs. The 20-page documentation gives concise installation and operation instructions and a number of suggestions for installing the program on a RAMdisk and creating a single menu choice for multiple DOS commands.

To create a menu selection, you enter the description and the path commands. For each selection, you can specify a password and whether or not it needs a parameter, and toggle a pause so that the results don't fly off screen. You select menu choices with function keys. Each choice executes either a program or a submenu, in effect offering a limitless series of selections.



PreCursor automates menu design. It also offers printer setup, predefined DOS commands, and auditing of time spent in applications.

PRECURSOR

PreCursor is probably the only program that really tries to automate as much of the menu-design process as possible. It also offers a printer setup procedure and a reasonable number of predefined DOS commands, and it allows you to set the system time and date. *PreCursor* also displays the time spent in a given application.

To prevent casual access to the maintenance facilities, *PreCursor* does not copy these facilities to the hard disk; access to applications can be password-protected.

Creating a menu involves entering the program description and its complete filename. *PreCursor* locates the path, either automatically or with a manual override. If you opt for the automatic path search, the first occurrence of the file is selected. While the manual search enabled me to locate the second occurrence of one program file, it was unable to find the second occurrence of the second program.

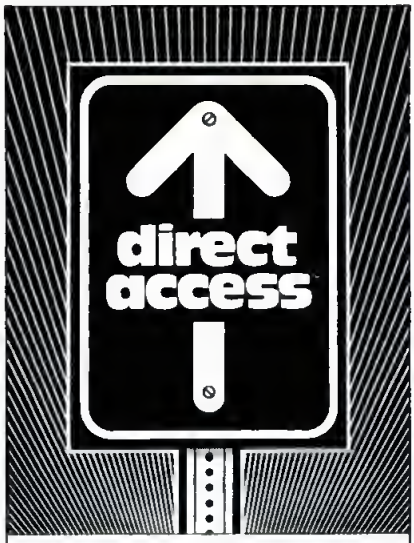
PreCursor may have some minor faults and bugs, but overall it is one of the better menu generators available.



Delta Technologies' direct access *is easy to use and offers usage tracking. The main menu can call submenus of up to 20 entries.*

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Eau Claire, Wisconsin 54703

CIRCLE 256 ON READER SERVICE CARD

■ MENU GENERATORS

a menu program—ease in designing menus, ease of use, and usage tracking.

The main menu can call submenus, and each submenu can contain as many as 20 entries. You define menus in the maintenance screen by entering the description, drive, directory, and filename. In some cases, you may have to customize a menu entry, especially with programs that look for overlay files on the current directory or the A: drive. The customization screen allows you to enter a maximum of 20 commands.

One nice feature of *direct access* is its ability to prompt the user to insert a blank or key disk. Batch and BASIC files must be preceded with the words BATCH and BASIC. Parameter passing is accomplished simply by entering an ampersand after the program name.

direct access's greatest strength, however, is in its ability to produce usage reports for management purposes. You can generate reports with a two-level sort on such variables as user name, project number, date and time, and application name; the results of the sort can be directed to either the screen or the printer. Options are also available for deleting data with a WHERE condition on sorted fields.

The program-configuration screen has a minor bug. While I was defining the colors, some menu text appeared rather than the color name. This, however, did not seem to bother the program's operation, and the problem did not appear again.

Whether you need a menu system for a company-wide installation or yourself, *direct access* is the way to go. PC

Vincent Puglia is a frequent contributor to PC Magazine.

PC MAGAZINE FACT FILE



***TOC I*, Version 1.0**
TOC Business Solutions Inc.
P.O. Box 129
Old Westbury, NY 11568
(516) 795-2800
List Price: $49.95
Requires: 128K RAM, DOS 2.0 or later.
In Short: *TOC I* is an effective menu generator but not quite as good as some of the other programs in this survey.
CIRCLE 548 ON READER SERVICE CARD



***PreCursor*, Version 2.0**
The Aldridge Co.
341 Town and Country Village
Houston, TX 77024
(713) 464-7465
List Price: $69.00
Requires: 64K RAM, DOS 2.0 or later.
In Short: *PreCursor* has a few minor faults but overall stands as an excellent program with truly useful features.
CIRCLE 549 ON READER SERVICE CARD



***direct access*, Version 4.0**
Delta Technology International Inc.
P.O. Box 1104
Eau Claire, WI 54702
(715) 832-0958
List Price: $89.95
Requires: 128K RAM, DOS 2.0 or later.
In Short: *direct access* has all the features you'd want, and they all work well. Among other assets, it extends DOS's batch processor and produces usage reports.
CIRCLE 544 ON READER SERVICE CARD

PC MAGAZINE EDITOR'S CHOICE

While none of the programs reviewed offers an ideal menu system, a few come close.

Delta Technology's ***direct access*** *was the most complete package, offering ease in menu design, customization of menu selections, and a sorting function in the reporting utility. The Aldridge Company's* ***PreCursor*** *also deserves special consideration because of its elegant interface and ability to automatically set the path to menu choices. Another program you might want to evaluate is Phoenix Systems'* ***Menu Manager;*** *its file manager and user-in-put facilities are extremely useful. ModTech's* ***Hard Desk*** *is an excellent choice for users who routinely route data from one program to another.*

EVERYTHING SYMPHONY WAS SUPPOSED TO BE.



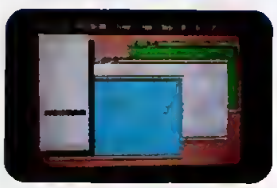
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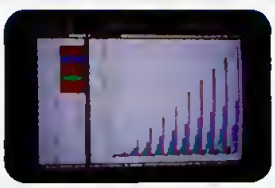
- Word Processing With Spell Checker
- Communications
- Spreadsheet
- Database
- Graphs

- Extremely easy to learn and use
- Data is interchangeable with all modules and other products
- Windows allow quick movement between tasks
- Four background, one foreground mode. Can print on two printers or plotters and two communication devices (modem and main-frame direct connection) all at the same time.
- Artificial Intelligence features reduce the number of keystrokes required to perform tasks
- Upgradable software and data to UNIX and XENIX

- **Package contains:** one plastic box, one illustrated reference manual, one program disk, one sample diskette, keycaps and user support plan
- **System Requirements:** IBM PC or compatibles, 512K, two 360K diskette drives, color or mono display
- Twenty-four hour Hotline Support (optional)



Multiple windows allow quick movement between tasks.



Colorful graphic representations

What the experts say:

"I can safely say that I have yet to come across a package which demonstrates such functionality combined with such an innovative approach to the man-machine interface. ABLE are to be congratulated on producing a product which achieves a very high standard of excellence."
—Michael D. Bowe, DATA GENERAL

"The best multi-purpose product I have evaluated. Multi-tasking works great, able to print, make an on-line connection and edit a document at the same time."
—Robert Lawrence, ITT INFORMATION SYSTEMS

CIRCLE 122 ON READER SERVICE CARD

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Access Speed

The Express Hard Disk Card comes with an average access speed of 80 msec. For only an additional $50 (that's $645 total), Express will ship you their 60 msec average access speed Hard Disk Card. Along with the additional speed, the 60 msec Hard Disk Card comes with head retraction.

Before you start to think you've got to have head retraction, you should know that the 80 msec Express Hard Disk Card is rated at 50 g's power off and 10 g's power on. Furthermore, our 80 msec Hard Disk Card has plated media. Most hard disks on a card have iron oxide (it looks and acts like rust), which means if the head hits the iron oxide, it will gouge out media and your data along with it. Plated media, on the other hand, looks like your car's chrome bumper. If the head hits, it will cause little or no damage. That's why Express offers the high g tolerance. All of the benefits of our 80 msec drive not withstanding, you may want to get our 60 msec drive just for the extra speed.

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The Express Hard Disk Card is compatible with most IBM PC or XT compatible computers, including but not limited to, Leading Edge® (Models M and D), Compaq® Portables and Desktop, AT&T, Sperry, Zenith, and most others.

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Express Systems, Inc., 1254 Remington Schaumburg, IL 60195

CIRCLE 380 ON READER SERVICE CARD

A dusting a day keeps the repairman away. Keep your PC clean, cool, and coffee- and static-free, and you're likely to spend less money fixing it.

A Dollop of Prevention,

Everything is in its place, secure and ready. Subdued, indirect lighting defines the equipment. The only sound is the hum of air-conditioning. Nonelectrostatic covers protect the keyboard and disk drives. You can see your face reflected in the shining monitor. Cables snake safely out of sight to steady power sources. A sign cautions against smoking or eating. A professional-looking tool kit including cleaning apparatus stands at the ready, along with a maintenance schedule and checklist.

This clean, cool, contaminant-free site may seem as remote from your overcrowded, sometimes dusty, perhaps smoke-filled office as a NASA lab or high-tech operating arena. It shouldn't be, because it's the ideal environment for a PC system.

PCs have taken computing out of the sacrosanct computer room and plopped it onto every sort of desktop and workspace available in offices, labs, factories, kitchens, shops, and construction sites. In the process they've been jostled, dropped, propped up precariously, spilled on, put in direct sunlight, enshrouded in smoke, covered with dust, and exposed to 90-plus-degree heat. They've had to compete with other machines and appliances for electricity and have been jolted with shocks from static that builds up in dry, carpeted rooms.

While PCs are hardier creatures than their mainframe ancestors, they still require good care and the right environment. The PC's nonmoving, electronic parts are very reliable, but mechanical parts like the keyboard, the disk drives, and the printer are particularly subject to Murphy's Law: If anything can go wrong, it will. Even if the problem is only minor and you can get a replacement in 24 hours, that's still 24 hours without your computer.

According to the research organization International Data Corp. (IDC), fully two-thirds of a computer's lifetime cost can be spent on maintenance and repair. Most companies are so firmly plugged into their computer systems that even the slightest downtime can cost thousands of dollars in lost processing time and delays. Even if you or your company contracts for the most costly maintenance and repair service—on-site—you want to be sure that you're not going to have to call the supplier very often. No matter whether your budget is large or small, when you're face-to-face with a problem that calls for repair, you're looking at time and data lost, inconvenience, aggravation, and wear and tear on your system.

Now it's more important than ever for users to

A Pinch of Repair

take some responsibility for maintaining the PCs on their desks. In many organizations, PCs are used independently of a central data processing (DP) group. The non-DP personnel responsible for them are sophisticated when it comes to applications but less likely to know how to take proper care of the systems. In addition, with sky-high service costs and a broad range of service options available (see "The PC Repairs Game," *PC Magazine*, Volume 5 Number 8), even some companies without in-house repair services are choosing not to contract for the manufacturer's on-site maintenance. These facts can add up to trouble: when your PC does go down, it can take longer to get it back on your desk than you can afford to wait.

Danger-fraught environments, inadequate power protection, and careless handling—these operator-controlled conditions are the three most frequent causes of PC debilitation. An ounce of prevention is the best cure: give your PC and peripherals the care they need to perform optimally, and you'll keep them out of the repair shop.

Here's *PC Magazine*'s guide to creating the right environment for your PC, keeping the various parts of your system up and running well, and troubleshooting repairs before you take your computer into the shop. Some of this advice is well known to experienced PC users; some is just common sense. The key is putting it to use, and you can do that even if you can't stand housework and will never be a technician.

THE RIGHT ENVIRONMENT Unless you're the type of person who can't wait for something to go wrong so you can fix it, you should create an environment that will keep your PC healthy longer.

■ Choose a stable, protected spot for your equipment. Stacking magazines and books under your monitor to raise it to a comfortable viewing angle, although standard practice in offices, can be dangerous. Someone could accidentally lean against it, causing it to topple to the floor. With the increased popularity of hard disks and the decreasing need to swap floppies, more and more users are taking system units off the desk and out of harm's way—next to the desk, under it, or even in a closet. A number of products are designed to squeeze the system unit into a safer haven.

■ Protect your system from direct sunlight. Keep other direct, heat-generating sources of light at a distance, too.

■ Dust your system frequently and keep it away from heating ducts. Although they're not a substitute for dusting, use the dust covers that come with your equipment or buy custom-made ones to fit your equipment and setting. Be sure the covers you use are made of nonelectrostatic fabric that won't attract dust. *PC Magazine*'s executive editor Paul Somerson swears by the customized dust covers made by CompuCover (P.O. Box 310, Mary Esther, FL 32569, (904) 243-5793). If you send CompuCover a sketch and the measurements of your equipment and workspace (a photo is helpful but not necessary), you can get an estimate of the cost by phone. Also, floppy disks attract dust; keep them in their envelopes when not in use to cut down on the dust they can introduce into your disk drives.

■ Don't smoke or allow anyone else to smoke around your computer. If you must smoke, be sure to blow the smoke away from your PC; try using an electric ashtray to diminish the amount of smoke in the air.

■ Keep your PC at a controlled temperature. Isolate it from heating units, radiators, or other sources of heat. Don't use it at temperatures above about 85 degrees Fahrenheit unless the air-conditioning is working (but not on the same circuit as the computer). Keep your system from heating up by making sure the vents aren't blocked by books, files, or other equipment.

■ Prevent accidents. Spilled drinks are said to account for more repair problems than any other factor. Whatever you drop on your computer can damage it—liquids, paper clips, pencil shavings. If you do spill liquid on your system, turn it off immediately (careful!: you can get a jolt if you don't) and try to drain or dry it to limit the damage. Don't put any liquid on top of the monitor, on the system unit, or anywhere near your keyboard. We've all seen keyboards with huge coffee or soda stains; the damage isn't always just cosmetic.

■ Prevent damage from static electricity. "Ground" the charges in your body by touching several objects before you sit down to work at your system. Antistatic mats and rugs under and around your PC, as well as antistatic sprays, can help.

■ Danger-fraught environments, inadequate power protection, and careless handling are the most frequent causes of PC debilitation.

SOLVING POWER PROBLEMS A surge protection device is an essential for protecting your PC. Be sure the one you're using guards against both common-mode voltage surges like those caused by lightning storms and normal surges that occur when you turn on a copier, for example, plugged into the same line as your PC. It should also be able to filter out erratic radio frequency interference that can affect your equipment.

Also look for a power regulator that includes outlets for more than one unit of equipment, a light indicating that the circuits are working, and a circuit breaker or fuse.

Older office buildings frequently have inadequate wiring, and power dips can occur during the day. Businesses that stand to lose considerable time and money if power is interrupted and data destroyed can find protection in more sophisticated equipment like Uninterruptible Power Supplies (UPS). A UPS should take care of all your power problems, making another power regulation device unnecessary. (For more details on power regulation and protection, see "Power Corrupts (But You Can Protect Your PC)," *PC Magazine*, Volume 5 Number 10.)

Once you've got the basics of environment control and power regulation under your belt, you can concentrate on maintaining (read cleaning), troubleshooting (read diagnosing), and repairing (read minor, unless you're a pro) each part of your system.

JUST RELEASED

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Mix any combination of fonts

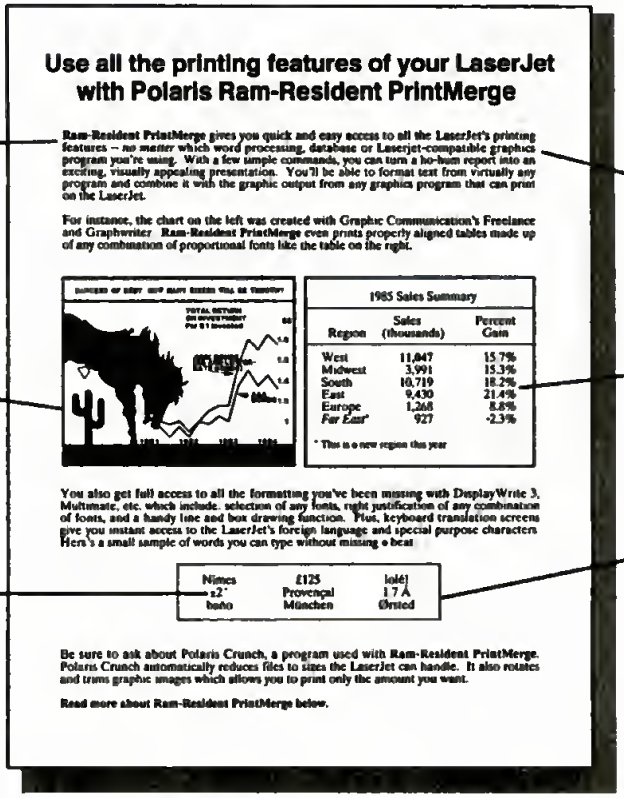
Merge text and graphics from any program

Print extended and foreign language characters

Justify any proportionally spaced text

Align tables printed with proportional fonts

Draw lines and boxes



Use all the printing features of your LaserJet with Polaris Ram-Resident PrintMerge

Ram-Resident PrintMerge gives you quick and easy access to all the LaserJet's printing features – *no matter* which word processing, database or Laserjet-compatible graphics program you're using. With a few simple commands, you can turn a ho-hum report into an exciting, visually appealing presentation. You'll be able to format text from virtually any program and combine it with the graphic output from any graphics program that can print on the LaserJet.

For instance, the chart on the left was created with Graphic Communication's Freelance and Graphwriter. **Ram-Resident PrintMerge** even prints properly aligned tables made up of any combination of proportional fonts like the table on the right.

1985 Sales Summary

Region	Sales (thousands)	Percent Gain
West	11,847	15.7%
Midwest	3,991	15.3%
South	10,719	18.2%
East	9,430	21.4%
Europe	1,268	8.8%
*Far East**	927	-2.3%

* This is a new region this year

You also get full access to all the formatting you've been missing with DisplayWrite 3, Multimate, etc. which include. selection of any fonts, right justification of any combination of fonts, and a handy line and box drawing function. Plus, keyboard translation screens give you instant access to the LaserJet's foreign language and special purpose characters. Here's a small sample of words you can type without missing a beat:

Nîmes	£125	løløl
x2˚	Provençal	17Å
bœuf	München	Ørsted

Be sure to ask about Polaris Crunch, a program used with **Ram-Resident PrintMerge**. Polaris Crunch automatically reduces files to sizes the LaserJet can handle. It also rotates and trims graphic images which allows you to print only the amount you want.

Read more about Ram-Resident PrintMerge below.

Your software only lets you use a small fraction of the LaserJet's printing capabilities. Unfortunately, that also limits how precisely you communicate your message. That's why you need Polaris Ram-Resident PrintMerge.

It's the only program that puts you in direct control of all the LaserJet's printing capabilities—so you control what your document looks like, not the limitations of your software.

You'll be able to add graphics right in the middle of your text. Use all the LaserJet fonts and extended characters wherever you like. And print it all beautifully with Ram-Resident PrintMerge's justification and line-drawing abilities. What's more, Rom-Resident PrintMerge works with the software you're already using, so it's very easy to learn.

Since Ram-Resident PrintMerge lets you merge graphics from virtually any program that prints on the LaserJet, you can reinforce complex ideas with illustrations right in the text. You can merge the graphic output or save a screen image, and merge either in any of four print resolutions. If your graphics are too large for your LaserJet to handle, try Polaris Crunch, a separate program that compresses, rotates and trims images.

Recommended by HEWLETT PACKARD

With the help of Rom-Resident PrintMerge's useful formatting features, your document will be as impressive as its contents. You'll be able to use LaserJet fonts in any combination for more attractive, readable text. And justify right-hand margins and align table columns printed with proportional fonts—even if they're downloaded from diskettes. For extra emphasis, use Ram-Resident PrintMerge's line and box drawing capabilities and the LaserJet PLUS patterns to highlight important ideas.

And when you need to use extended or foreign language characters, Ram-Resident PrintMerge's five keyboard translation screens will put them at your fingertips instantly.

But even with all these features, Ram-Resident PrintMerge is truly easy to use.

Runs Directly From:

DisplayWrite 3	**WordStar**
Multimate	**Microsoft Word**
Freelance	**Graphwriter**
Lotus 123	**Javelin**
Paradox	**WordStar 2000**
NewWord	**Framework**
R:base 5000	**Easy**
Map-Master	**Microsoft Chart**
WordPerfect	**PC Crayon**
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DOs AND DON'Ts

Observe these warnings and prescriptions whenever you clean, diagnose, and/or repair your PC.



Do turn all power off and disconnect everything when cleaning and repairing; if you must work with equipment on, exercise caution and don't touch anything live.



Don't hesitate to leave your PC on all day even if you're not using it for long periods; turning it on and off causes more wear and tear than just leaving it on. Do turn the monitor brightness down, though.



Don't remove a floppy disk when the indicator light is on, but never leave it in the drive when you've finished working. Observe the usual disk-handling rules at all times.



Do consult your manual before and frequently during any cleaning and repair work.



Don't try to push your printer's printhead from side to side by hand when the printer is on; don't use the handle on the side of the machine to move the platen (instead, use the form feed or line feed buttons to roll paper through).



Don't overtighten the screws and nuts on the casing.



Don't jerk or suddenly release the levers that open and close your floppy disk drives; move them gently.



Don't think that resorting to the local repair shop for help is a major defeat; asking for help may be just plain good sense in the long run.—**Carol Olsen Day**

MONITOR Video display terminals are tricky to repair (usually repair really means replace), and they contain high-voltage current and a delicate CRT tube. Your aim should be to keep your monitors clean and dust-free—leave major work to the repair shop. Use a cloth dampened with water (or sprayed with some detergent, but never spray your machine—you'll dampen something inside) to clean the screen and entire chassis. Be careful not to dribble any moisture inside. Disconnect and check the cable if your display is intermittent or flickering. Keep the monitor covered when not in use.

If you're greeted by a blank or illegible screen, you can do a few things to try to remedy the situation or at least help diagnose the problem. First check the brightness, contrast, and hold. If you've still got trouble, turn the power off and look to the cables, connectors, and the monitor driver board inside the PC. Unplug and replug each one in turn, and then try again. Check the cables. Is there a continuity problem? To assess continuity, with the cable removed entirely and your voltmeter (see sidebar, "A PC-Upkeep Tool Kit") set to read ohms (x1), touch the probes to the end of each wire (pin 1 to pin 1, and so forth).

If the PC's power-on self test (POST) indicated a malfunction when you turned on your PC, the circuit board is probably the culprit. The error code for a monochrome monitor is 4xx, and for a color one it's 5xx. One long and two short beeps indicate monitor problems. To test the monitor, you'll need another monitor, cable, and perhaps an adapter card. Try hooking up each one in turn, eliminating each as a source of trouble if you get no satisfaction. If you try another monitor with your system and it works, you'll know your monitor is at fault. Alternatively, if your monitor works on another PC, your cable or adapter card is at fault.

KEYBOARD First, prevent spills—the number-one threat to keyboard health—by prohibiting eating or drinking near your PC and by using a cover when your keyboard is not in use. To keep your keyboard clean, vacuum it regularly with the soft bristle attachment on a vacuum cleaner and spray compressed air between the keys to dislodge dirt particles. Unplug and clean the cable. If a key is stuck or performing poorly, carefully pry it up with a screwdriver positioned under its edge; when it pops up, wipe it off and clean out its niche on the keyboard by blasting it with compressed air.

For switch or circuit problems, see your repairman. To diagnose the source of the trouble beforehand or to know whether you might be better off buying a new keyboard instead, follow the advice of Gene B. Williams, author of *How to Repair and Maintain Your IBM PC* (Chilton Book Company, 1984): If POST gives you an error code indicating a keyboard problem or if the keyboard is obviously not working correctly, first check the voltages by removing the keyboard plug from the back of the PC, setting your meter to read in the 6-volt DC range, and attaching the common (ground) to pin 4. Then touch the other pins; your reading should be between 2 and 5.5 volts; incorrect voltages indicate a problem inside the PC. Before giving up, check the cable as described above for monitor cabling.

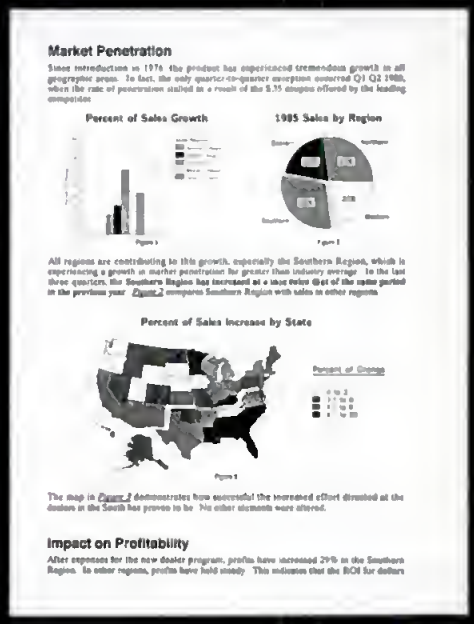
CPU AND MEMORY When troubled with errors or "hangs," try opening the cover of your system unit to check the seating and the cleanliness of the boards. Here's what David Bellin, author of *The Complete Computer Maintenance Handbook* (Harper and Row, 1986), recommends: With the power off, remove each board individually and blow compressed air into its place; then take a soft, pink pencil eraser and gently run it over the gold contacts. Brush off the residue and reinsert each board, making sure it's firmly attached to the connectors.

If your PC's built-in diagnostics program indicates you have a bad CPU or memory chip, you may be able to replace it yourself. Here's how *PC Magazine*'s product-testing editor Michael O'Cone advises doing it: Make sure that the unit is off and all external cables unplugged. Once you have isolated the faulty chip (the diagnostics program may tell you which one, or you may have to try them all), gently pry the chip from its socket, preferably

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Percent of Sales Growth

1985 Sales by Region

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Percent of Sales Increase by State

The map in Figure 3 demonstrates how successful the increased effort directed at the dealers in the South has proven to be. No other elements were altered.

Impact on Profitability

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with a chip remover or nonmetallic screwdriver. It's important to install the chip so that pin 1 of the chip is aligned with pin 1 of the socket. This side can be easily identified: it's the end of the chip or socket with the small notch or dimple in it. Sound easy? Take care—O'Cone warns against cracking the ceramic or bending one of the leads. And Gene Williams says, "Unless you can swap a chip or see obvious physical damage, repair is usually by replacement of the board." Even a malfunctioning board, fortunately, has trade-in value.

DISK DRIVES Disk drives are so complex that they merit an article of their own (see "Maintain Your Sanity: Maintain Your Disk Drives," *PC Magazine*, Volume 4 Number 6). Henry F. Beechhold, author of *The Plain English Maintenance & Repair Guide for IBM Personal Computers* (Simon & Schuster, 1985), advises: "Unless you intend to become your neighborhood disk drive repairperson, you're better off letting the specialists handle the sticky problems."

You can, however, do a little troubleshooting before you haul your drive to the shop. Several companies make disk drive diagnostic programs or analyzers; two are *Interrogator* from Dysan Corp. (Santa Clara, California) and *Memory Minder* from J&M Systems Ltd. (Albuquerque, New Mexico). If you suspect that you have disk drive problems, giving one of these programs a spin will help narrow down the area of trouble. You'll be able to check things like head alignment, disk centering, and spindle speed or rotation rate.

To keep drives running smoothly, frequent cleaning is a must. Clean floppy drives twice a year, with flashlight in hand to see into the drives. Use a cotton swab saturated with cleaner or alcohol to clean the read/write heads gently, moving in the direction in which the disks rotate. Clean removable cartridge drives the same way, and replace removable filters every 6 months.

PRINTER Paper shreds and ink make the printer the messiest component of any system, and so the experts advise that you clean and lubricate your printer once a month. First, disconnect the cable and power and remove the paper as well as the ribbon. Take off the cover and top shell; wipe them with a damp cloth. Use the vacuum cleaner to brush over the exposed area and then blast everything with compressed air. Remove and then clean daisy wheels or Selectric-style printheads with special kits available for that purpose or use an old toothbrush and some cleaning solvent. Consult your printer manual for lubrication tips.

Printers have more mechanical parts than most other PC system components and therefore suffer significantly more wear and tear. If something goes wrong, first look at the manual for an explanation of any error signals. Then look for the obvious: are the adjustments for spacing and forms thickness correct? Next, if your printer has a built-in self-test, run it and compare the results with the test you ran when the printer was running well. If the self-test indicates that the printer is okay, your problem is in the printer interface, the cable (test for continuity as above and also see what happens when you try another cable), or the PC (try using your printer with another PC to see if yours is the culprit).

CAUTIONARY NOTES Henry F. Beechhold's *The Plain English Maintenance & Repair Guide for IBM Personal Computers* offers these general tips for small do-it-yourself repair jobs: Turn the power off and pull the plugs in most cases before starting work. Remove all rings, watches, and any other metal, so you

A PC-Upkeep Tool Kit

TOOL	DESCRIPTION	FUNCTION
Vacuum cleaner	With soft brush attachment	General cleaning
Screwdrivers	Various sizes; Phillips-head and straight-head	Loosening and tightening screws on chassis
Volt/ohm meter	Standard variety, digital or analog	Checking continuity on cables
Chip puller/inserter	Small, inexpensive	Replacing CPU and memory chips
Flashlight	Standard	Illumination
Lubricating spray	WD-40 or a Teflon-based lubricant like Radio Shack's BreakFree or Jensen's TriFlow	Lubricating moving parts
Alcohol	Pure isopropyl, from a drugstore	Cleaning disk drives
Cleaner/degreaser	Available from Radio Shack or similar supplier	Cleaning printer
Compressed air	Spray can, from photo shop	Removing dust
Pencil eraser	Soft, pink type	Cleaning contacts on boards
Swabs	Reusable foam type or drugstore cotton brand	Cleaning disk drives
Cloths	Lint free	General cleaning

Optional but handy:

Tweezers, for holding and moving small parts and wires
Magnifying glass, for examining small areas
Wire stripper, for stripping wires, making your own cable
Needle-nose pliers, for holding and manipulating wires
Dental mirror, for looking into nooks and crannies
Old toothbrush, for cleaning jobs

won't be the victim of a short circuit. When removing screws or other hardware, put them in marked containers that indicate where they came from. Use the right tools (see sidebar, "A PC-Upkeep Tool Kit"). Know what you're doing before you attempt to do it, and keep notes as you go along so you know where you've been and where you're going.

A few pieces of sensible advice may help you as you embark on your new schedule of maintenance:

■ If your equipment is still under warranty, don't tamper with it except to keep the system clean on the surface or you'll risk violating the warranty. (Contributing editor Winn L. Rosch recommends keeping a brand-new PC on continually for the first week or so to test its reliability. If anything is wrong with the system, it will show up right away, and you can send the machine back pronto.)

■ If it ain't broke, don't fix it. And if it does break, be sure to read your manual to see what the manufacturer recommends.

■ Know and respect your limits, especially if you're brilliant at, say, strategic international planning but a klutz when it comes to anything simply mechanical. When you overreach your abilities, you may be gambling not only with the cost of the system but with the dreaded prospect of data loss as well.

■ If you're at all handy, keeping your PC purring is not all that complex or daunting.

On the other hand, if you're at all handy, keeping your PC purring is not all that complex or daunting. You'll find, too, that there are hidden bonuses: a better understanding of your PC and a new feeling of control over your system.

You're not likely to give your business PCs the same kind of gentle handling you'd give your home computers. Despite negligence, most personal computers tend to run and run and run, but don't let that tendency make you feel too secure. Someday, some part of your system will break down. Preventive maintenance and care give you an edge against that day—and a cleaner, smoother-running PC to use until then.

Carol Olsen Day's most recent book is The New Immigrants *(Franklin Watts, 1985). She is an expert on corporate career strategies and has written extensively on that subject. Based in New York, she also writes for television.*

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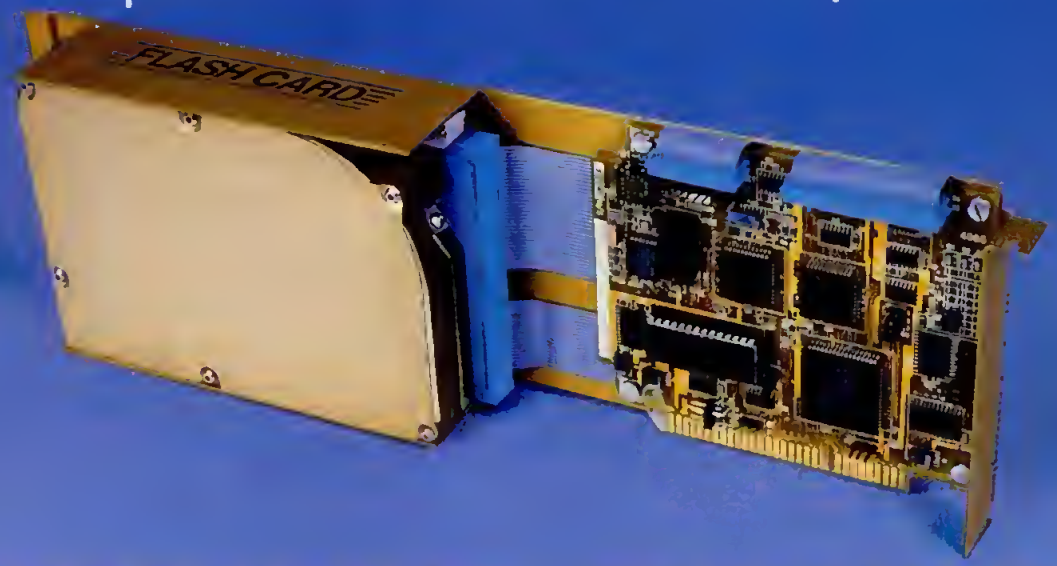
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Taking the Bite out of TURBO PASCAL

14 Utilities

Turbo Pascal introduced a new generation of users to Pascal programming. These program editors, libraries of routines, and screen generators for Turbo make it even more accessible to programmers on all levels.

Turbo Pascal has had a significant impact on the PC programming community. Borland International's low-cost, efficient Pascal compiler has made it possible for many amateur and novice programmers to try their hand at a compiled language, with its advantages of fast, easily modifiable, and source-protected code.

Unfortunately, Pascal is not as easy to learn as BASIC. Its structured programming and strict typing of all variables and constants can be confusing to the beginner. It also has severe deficiencies as far as screen I/O (input/output) functions go. Writing programs that ask for input from the user takes many more steps to complete than similar functions in BASIC.

Many third-party vendors are compensating for Turbo Pascal's deficiencies with an assortment of programming utilities that do everything from providing prewritten I/O procedures that enhance your own programs to generating entire database programs from scratch. Many of these programs will get you up to speed with Pascal in days or weeks instead of the months a beginner would ordinarily need. The level of Pascal and progamming knowledge expected from the user varies with each utility, as does the ease of modifying the routines and including them in your Pascal programs.

Most of these programs work via the Pascal INCLUDE file. When you write a program, you refer to predefined functions and procedures that are included near the beginning of your source code. The process is similar to using a GOSUB routine in BASIC, except that you don't need to worry about program line numbers here: each procedure is accessed by name. (Check out either the Turbo Pascal reference manual or *The Turbo Tutor* for more information.) A few programs also use precompiled .COM files as EXTERNAL procedures; these are particularly nice because they save valuable compiling time without adding much to the size of your program.

THE BORLAND TOOLBOXES It's not surprising that some of the best Turbo Pascal programming utilities are offered by Borland itself. Each of Borland's Pascal Toolbox packages includes one or more disks and a paperback manual very similar in style to the Turbo Pascal manual. The programs in the Toolbox series are crammed with excellent routines, procedures, functions, and programming examples, including a lot of source code to print out and study.

THE TURBO TUTOR

For users new to the world of strictly typed variables, functions, and procedures, *The Turbo Tutor* is the place to begin. *The Turbo Tutor* disk contains 25 demonstration programs that cover many aspects of Pascal programming, including function key handling, directory access, I/O error checking, a Microsoft Mouse interface routine, a serial port library, and a sample game. One particularly useful program, LISTT.PAS, contains the source code for a formatted printer listing of Pascal programs.

One handy feature that *The Turbo Tutor* lacks (as does the Turbo Pascal manual) is a quick reference card with a complete alphabetic listing of all functions and procedures available. They are listed in the in-

PC MAGAZINE FACT FILE



The Turbo Tutor
Borland International Inc.
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In Short: A useful introduction for beginning Pascal programmers with some good demo programs and an adequate manual.

CIRCLE 662 ON READER SERVICE CARD



Turbo Graphix Toolbox
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CIRCLE 130 ON READER SERVICE CARD

dex, but there they are divided into categories such as "standard functions" and "turtle graphics procedures," so you have to know where to look in order to find a specific function. *The Turbo Tutor* and the other Toolbox packages would also be more accessible if their manuals were in three-ring binders instead of paperback books. Alternatively, several large stones used as paperweights will help you hold these reference works open at the right page.

TURBO GRAPHIX TOOLBOX

Graphics applications is an excellent area for Pascal programming: Pascal beats BASIC hands down in speed and authority when handling graphic routines. The *Turbo Graphix Toolbox*, Version 1.05A, includes 115 procedures and functions ideal for graphics programming, and each one is listed in the accompanying manual with a complete description and an example of its correct use.

The *Turbo Graphix Toolbox* routines are compatible with IBM's standard and enhanced color/graphics system, as well as the Hercules graphics card and its true compatibles. The 27 sample Pascal programs include many demonstrations of the proper way to use these routines. Some of the more interesting ones include operations on windows (areas of the screen that can be independently opened, cleared, closed, and overlaid on each other), bar charts and histograms, and world coordinate systems that establish where on the screen each window or graph will be located. Pie charts, logos, *x-y* labels for graphs, and three different graphic character fonts are also included.

All of the program's functions and procedures are clearly explained in the manual's reference section. In addition, several sample programs illustrate the use of the *Turbo Graphix Toolbox*'s various graphics functions.

BORLAND EDITOR TOOLBOX

With the *Borland Editor Toolbox*, Borland offers Turbo Pascal programmers a chance to create a new *WordStar*-like word processor of their own. This package includes two disks and a hefty manual that contains two complete word processing programs, *FirstEd* and *Micro Star*. *Micro Star* has most of *WordStar*'s features, such as word wrap, paragraph reformatting, block moves, and auto indents, plus such additions as pull-down menus and a provision for opening a second text window in order to edit two files simultaneously. *FirstEd* is a simpler word processing program that

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demonstrates the basic functions required by a text editor.

The complete source code is included, so you can modify these files to your heart's content and then recompile. In addition, you can give sophisticated word processing capabilities to other programs that you write by including the text-editing feature from this package.

Another nice feature of the *Borland Editor Toolbox* is its built-in "hooks" for attaching other programs to it—commercial ones and programs you write yourself. You can call up *Turbo Lightning*, for example, to run a spelling check on an entire file or a marked block of text. *Micro Star* can also be configured for multitasking; in the multitasking mode you can print text, back up a hard disk, or send or receive a file by modem while simultaneously editing text.

The source code for *Micro Star* is a good example of well-structured programming, with each word processing function enclosed in its own module. Each of these modules is listed and described in the accompanying manual.

PC MAGAZINE FACT FILE



Borland Editor Toolbox
Borland International Inc.
4585 Scotts Valley Dr.
Scotts Valley, CA 95066
(408) 438-8400
List Price: $69.95
Requires: 128K RAM, one disk drive, Turbo Pascal 2.0 or later, DOS 2.0 or later.
In Short: A "write your own word processor" program for intermediate-level programmers, with lots of help in the form of prewritten procedures covering everything from word wrap to pull-down windows.

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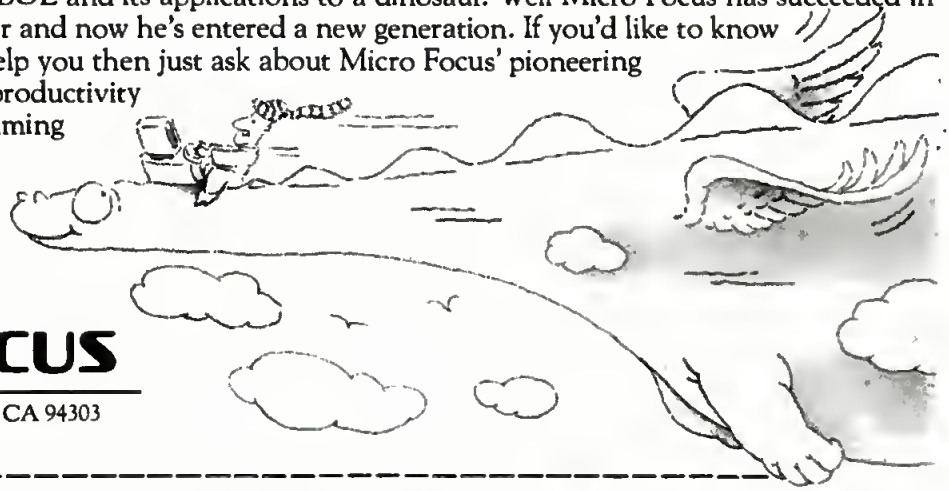
TURBO DATABASE TOOLBOX

The *Turbo Database Toolbox* supplies instructions, sorting and indexing routines, and several sample programs to start you on programming tailor-made database applications. The manual steps you through the basics of data files, with additional information and programming examples of data files, multiple keys, data indexes, binary searches using B+Trees, and more.

The manual claims that a detailed knowledge of procedures like B+Tree multi-index searches is not required in order to use the procedures in this package. In case you want to inquire into such complex programming practices, a fairly thorough introduction to B+Tree routines is included. You can use the INCLUDE files that are part of the package to write your own database system, but before attempting such a large-scale project you should

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take the time to become familiar with all the topics discussed in this manual.

The disk includes files that give you access to the data records and keys on which the records are to be sorted, with modules on adding, finding, and deleting records, plus B+Tree routines to patch into your programs. An Install utility lets you install programs you've written for clients in their specific terminals. The disk also contains sample database programs consisting of simple customer and inventory lists.

PC MAGAZINE FACT FILE



Turbo Database Toolbox
Borland International Inc.
4585 Scotts Valley Dr.
Scotts Valley, CA 95066
(408) 438-8400
List Price: $54.95

Requires: 128K RAM, one disk drive, Turbo Pascal 2.0 or later, DOS 2.0 or later.
In Short: An excellent start for writing your own database, simple or complex. Beginners will have to work hard to gain a full understanding of all the routines included here.

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TURBO POWER TOOLS

Although Turbo Pascal itself lists for $69.95, professional programmers aware of Blaise Computing's reputation are quite willing to pay $99.95 for *Turbo Power Tools*, Version 1.0, an add-on collection of programming utilities.

Turbo Power Tools is supplied on three disks that contain more than 100 INCLUDE files covering a wide variety of programming functions. There are 14 file-handling routines for creating, opening, reading, or setting file attributes, dates, and times as well as handling DTAs (Disk Transfer Addresses), 6 memory manage-

PC MAGAZINE FACT FILE



Turbo Power Tools
Blaise Computing Inc.
2560 Ninth St. #316
Berkeley, CA 94710
(415) 540-5441
List Price: $99.95
Requires: 128K RAM, two disk drives, Turbo Pascal 2.0 or later (3.0 recommended), DOS 2.0 or later.
In Short: A comprehensive and professionally packaged set of INCLUDE files, utilities, and demonstration programs that will help Pascal programmers on all levels write better programs.

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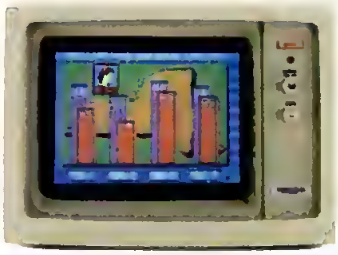
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ment routines, 11 string functions, 18 routines governing screen I/O (including routines that permit horizontal as well as vertical scrolling), 12 for multiple-window management, 11 dealing with the IBM keyboard, 10 DOS utility functions, 14 procedures for directory maintenance, and 6 routines for memory management that can allocate, free, and alter memory blocks (including AT extended memory). Five routines deal with program control, including executing DOS commands, terminating and setting exit codes, and even terminating and remaining resident so that you can code memory-resident programs in Turbo Pascal.

The *Turbo Power Tools* manual fills 146 pages with individual descriptions on each procedure and function with an example of its use and a list of INCLUDE files necessary to call the routine correctly. The documentation is divided into ten chapters, each dealing with the procedures governing one aspect of Pascal programming. Each section has a well-written introduction that supplies much useful information on the best way to use the *Turbo Power Tools* routines, as well as standard Turbo Pascal procedures. The nine appendixes include a quick-reference guide, a summary of all *Turbo Power Tools* data and variable types, a comparison of screen and window management, suggestions for troubleshooting and program development, installation instructions, a DOS error-code summary, and instructions for the *Turbo Power Tools* utility programs.

The *Turbo Power Tools* utilities and demonstration programs alone make the package worthwhile. INCLUDE.PAS generates lists of INCLUDE files needed for programs you write and places them in the correct order for most efficient compilation. PROCPAK strips the comments from the *Turbo Power Tools* INCLUDE files to make compilation faster and generates paginated listings of program files.

Also included in the *Turbo Power Tools* package are two sample programs. CLOCK.PAS establishes a runtime clock that displays the system time on the screen and can display a message and ring an alarm at predetermined intervals. It can also be removed from memory or have its alarm, message, or text color reset. MKEY.PAS (for Modest Key) is a keyboard macro utility complete with pop-up windows and many (but not all) of the features usually found in programs such as *ProKey*. It can be installed and then removed from memory at the user's option.

A high degree of professionalism pervades the entire package. *Turbo Power Tools*' only deficiencies lie in the field of graphics management, where its range is limited to ASCII or text mode screen and window support. With this one exception, *Turbo Power Tools* is the best support available for Turbo Pascal programming.

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Oakland, California 94611

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TURBO ASYNCH

Turbo Asynch contains functions for programmers working with asynchronous communications and using the UART (universal asynchronous receiver and transmitter) chip found in the PC and AT. Blaise Computing has divided the package's support routines into two distinct levels. The lower-level (Level-Zero) routines are written in assembly language for efficiency and speed. They come in source (.ASM) and assembled (.OBJ) versions that you can use directly or via the high-level (Level-One) Pascal procedures contained in .INC files.

Strict compatibility with the IBM design is required in order to use *Turbo Asynch* because it makes calls directly to the UART and 8259A Programmable Interrupt Controller found in the IBM PC and AT. Level-One functions also use RS-232 BIOS function calls.

The manual contains a very readable introduction to asynchronous communication techniques, along with a complete listing and description of the 6 low-level and 18 high-level functions. A quick-reference guide and comments on two sample programs to send and receive messages and test the functions are included as appendixes. Blaise also includes information on printing the *Turbo Asynch* source code, creating a test environment, and constructing test hardware (a null modem) to check your serial ports. Since the Level-Zero functions cannot be linked directly to the Turbo Pascal programs created with the Level-One procedures, a .COM file is included (along with its source code in C) to establish the Level-Zero functions in memory; you can call them from there using a software interrupt vector. Level-One functions include procedures to open and close comm ports, set transmission options, read and write characters or strings to and from the port, return the line and modem status, check on and drain the I/O queue, and send a break signal.

PC MAGAZINE FACT FILE



Turbo Asynch
Blaise Computing Inc.
2560 Ninth St., #316
Berkeley, CA 94710
(415) 540-5441
List Price: $99.95
Requires: 128K RAM, two disk drives, Turbo Pascal 2.0 or later (3.0 recommended, DOS 2.0 or later.
In Short: A comprehensive set of low- and high-level communications routines for intermediate and more-expert Pascal programmers, with a manual that is in itself a handbook of asynchronous programming practice.

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FIRSTIME FOR TURBO-PASCAL

FirsTime for Turbo-Pascal is a program editor with a difference: it "knows" the programming syntax and structure of Turbo Pascal. If you need some help in generating Pascal programs, don't want to read all the manuals, and don't mind having someone constantly looking over your shoulder and pointing out your mistakes, *FirsTime* is the editor to try.

FirsTime is supplied on two disks: One contains the editor and support files, the other an on-disk tutorial. The reference manual contains about 200 pages of well-indexed instructions, an alphabetical listing of the programs' place holders, and a command-key summary and listing of error messages.

To write a program with *FirsTime*, just type FTD and press the Enter key. You will be greeted with a brief logo screen that quickly clears to show the edit screen with the current function key assignments. *FirsTime* is designed so that you almost automatically follow correct programming practice when you enter Pascal source code. For example, the first command acceptable to *FirsTime* is a program name identifier. It will then accept declarations of constants, types, and variables.

Each time you enter a statement, the range of possible choices at that programming point is displayed near the bottom of the edit screen (similar to the BASIC editor screen). Using a combination of function keys, the Alt and Ctrl keys, and alphabetic keys, you enter the program and check it for syntax simultaneously. Each logical portion of code (for example, an IF-THEN-ELSE structure) is highlighted in intense video while you are editing it, which makes it easy to see the interrelationships of all the lines in a particular program module. All reserved words are written in capital letters, which also helps you keep track of the program's structure.

FirsTime works by creating a special configuration file in memory while you are entering a program. This file, which is saved to disk at the same time as the program source code and has the extension .FPT, keeps track of every statement in the source code (and corresponding INCLUDE files). If you ask the program to edit a preexisting program, it creates the .FTP file while the program is being read into memory and will later write the file to disk if you wish.

FirsTime is great for checking code syntax in existing programs. Its zoom feature allows you to choose the nesting levels of your source code: only the levels chosen will be shown, with ellipses (. . .) indicating program levels underneath the ones chosen. The editor allows standard editing procedures such as deletes, undeletes, and text searches, but it checks all such functions for possible syntax violations before accepting them. If you wish to avoid this syntax checking, you can toggle the editor into a regular full-screen editor with the Esc key. You can ask *FirsTime* to check the source code at any time to ensure proper syntax and structure.

Moving around in *FirsTime* is an interesting experience. You can move the cursor with the cursor control keys, but as you move from one program unit to another, the entire logical unit at the moment is highlighted.

FirsTime is a handy and useful program, as long as you don't mind a nagging computer.

TURBO-FORMS

Turbo-Forms is a programming development package that helps simplify the chore of establishing user-input screens. The single disk contains a forms editor, support files, and a simple address cardfile sample program, along with a 48-page typeset 8½ by 11 manual prepunched for a three-ring binder, which is not included.

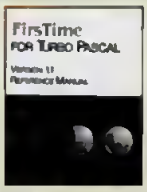
Using the FED.COM editor (obviously designed using *Turbo-Forms* itself), you can design up to two dozen forms per file, each containing fields for data input. Once you have designed the screen form, you save it to disk and call it from the main Pascal program with the procedures supplied on the *Turbo-Forms* INCLUDE file GLSFORMS.BOX. You write the calling procedures yourself, using the cardfile program as an example. The manual has a skeleton program showing how the form routines to be included are called.

The input fields on the *Turbo-Forms* screens can be set to screen out undesirable characters using a device known as a sieve. Four sieves are standard: alphabetic characters only, numbers only, Boolean (true/false) replies, or any character. You can custom-design ten other sieves.

PASCAL'S FRIEND

Pascal's Friend, Version 2.0, is a straightforward set of functions and procedures intended to assist you in designing and writ-

PC MAGAZINE FACT FILE



FirsTime for Turbo-Pascal
Spruce Technology Corp.
198 E. Bergen Pl.
Red Bank, NJ 07701
(201) 741-8188
List Price: $74.95
Requires: 256K RAM (384K recommended), one disk drive, Turbo Pascal, DOS 2.0 or later.
In Short: A programming editor with built-in syntax checking and keyboard macros that can simplify the life of anyone willing to learn the key assignments and editor routines.
CIRCLE **655** ON READER SERVICE CARD



Turbo-Forms
Great Lakes Software
2510 Capital Ave. SW, #203
Battle Creek, MI 49015
(616) 962-2017
List Price: $39.95
Requires: 128K RAM, one disk drive, Turbo Pascal, DOS 2.1 or later.
In Short: This basic forms and screen I/O editor produces routines that you can patch into your programs and requires intermediate programming.
CIRCLE **654** ON READER SERVICE CARD

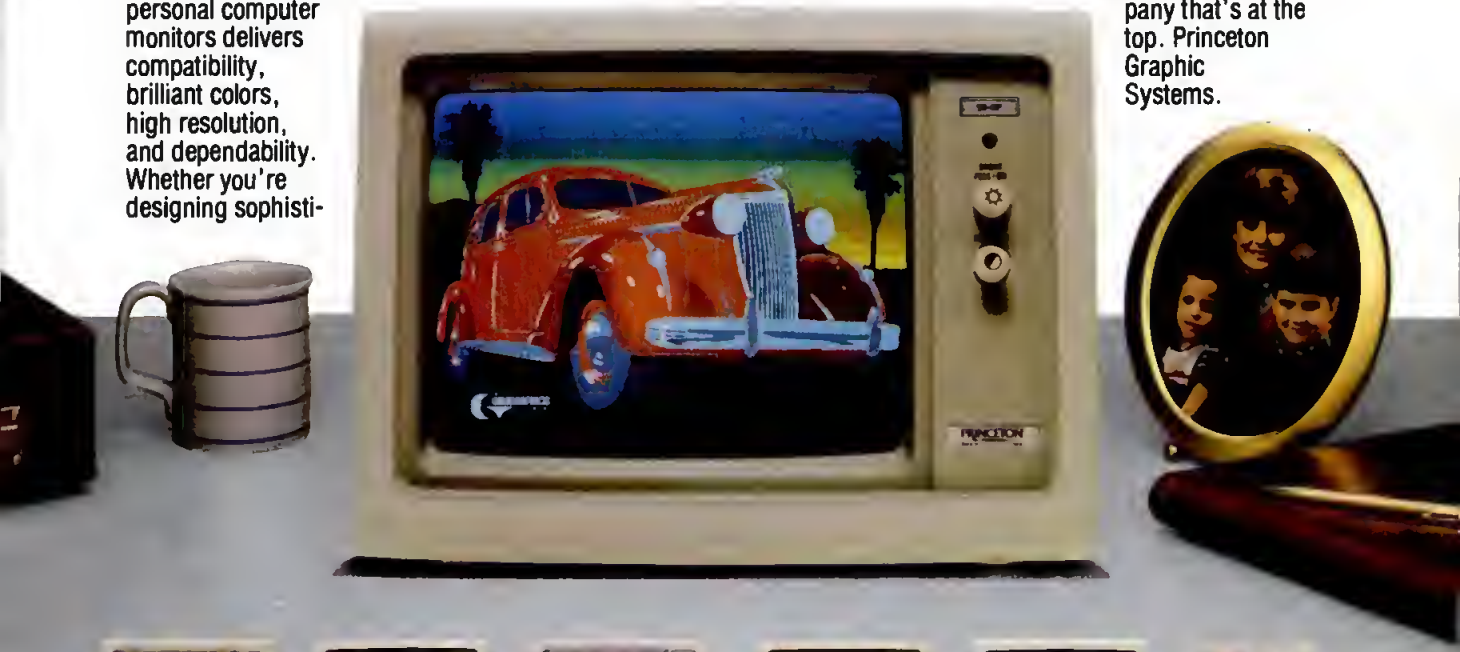


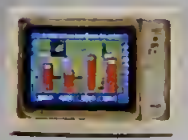
Pascal's Friend
J.S. Computing
815 N. 12th St. #5
Allentown, PA 18102
(215) 821-9020
List Price: $49.95
Requires: 128K RAM, one disk drive, Turbo Pascal 1.0 or later, DOS 2.0 or later.
In Short: A brief but useful set of Pascal procedures with good screen and keyboard handling, DOS access, and a bounce menu. Good for beginners.
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SR-12. Super high resolution RGB monitor with a .31mm dot pitch. Compatible with Sigma Designs Color 400 board and others. Gives you 400 lines of resolution. Nonglare screen



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HX-9/HX-9E. Compact nine-inch high resolution RGB monitor. Perfect for workstations where space is at a premium. Both feature a .28 dot pitch and an etched dark glass screen. Ergonomic features like a built-in tilt/swivel base, nonglare screen, and a built-in green/amber switch. HX-9E is compatible with IBM's EGA (or equivalents)

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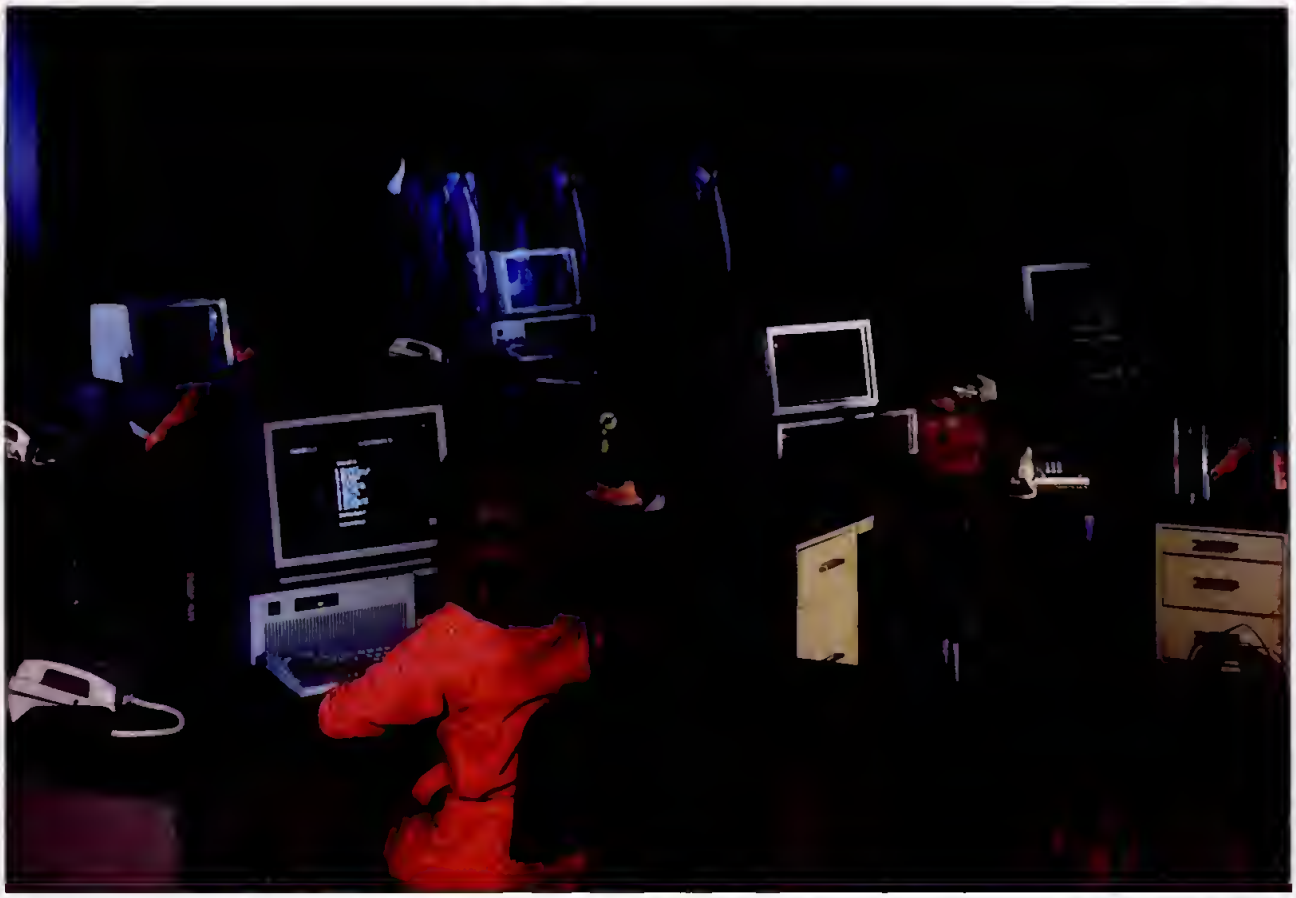
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MICROSTUF®

CIRCLE 326 ON READER SERVICE CARD

1000 Holcomb Woods Parkway
Roswell, Georgia 30076

For the IBM Personal Computer. Requires 128K RAM, two disk drives, PC-DOS, Asynchronous Communications Interface or equivalent RS232 connection, and a modem compatible with the "AT" command set. TRANSPORTER, CROSSTALK and MICROSTUF are registered trademarks of Microstuf, Inc.. IBM is a registered trademark of International Business Machines Corp.

TRANSPORTER®

ing Pascal programs. The single disk is accompanied by a 46-page, 8½ by 11 spiral-bound manual describing the 13 INCLUDE files that handle selected groups of functions such as screen file and keyboard handling, date and time setting, DOS access procedures, and direct writes to disks. The procedures are all clearly described in the manual and are accompanied by three demonstration programs with all source code included. The manual is indexed, and an appendix contains a complete listing of all procedures and functions (except one), all in one place. I wish the same were true of the Turbo Pascal documentation.

Pascal's Friend has been around since Turbo Pascal's early days. A few of the procedures duplicate standard functions now found in Turbo Pascal 3.0, and some refer back to Version 1.0. The procedures in MENU.INC are handy and useful in program development: the menu as written loads the current choices available from an ASCII text file, allowing you to make changes in wording and screen placement without recompiling the source code. A "bounce" type menu highlights the current selection in reverse video and moves vertically or horizontally under the control of the cursor keys.

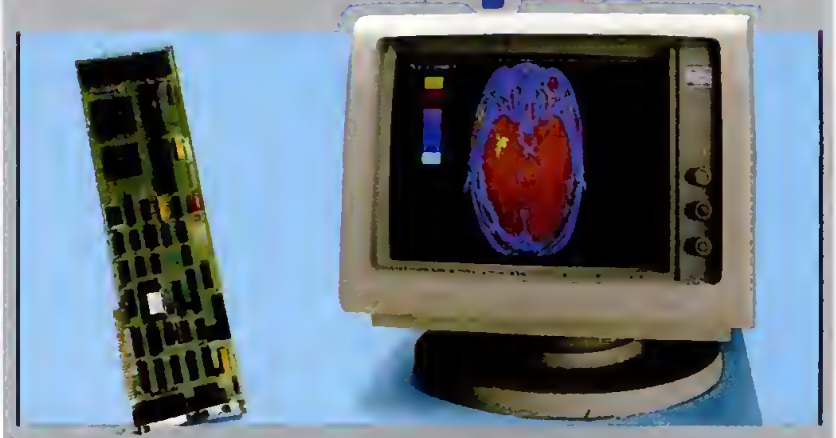
Other procedures handle directory listings and help convert programs from MS Pascal to Turbo Pascal. Two procedures that read and write directly to a disk sector should be treated with extreme caution by a novice programmer because they can completely destroy the file allocation table of the disk being accessed.

Pascal's Friend gives you three sample programs: a daily reminder calendar, a demonstration of writing directly to the video buffer (for IBM and close compatibles only), and a program that saves the current screen to a disk file.

TOOLS FOR TURBO PASCAL

Tools for Turbo Pascal's single disk contains 44 INCLUDE files with procedures and functions to be incorporated into your Turbo Pascal programs. No printed manual is supplied, but a "Readme" file on the disk contains all the information you need

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to use the program. The INCLUDE files are small and well organized, with specific functions grouped logically. The programmer can choose a tight cluster of INCLUDE files to keep final program size as small as possible.

Three dozen 200- to 400-byte sample programs demonstrate the use of the procedures supplied. *Tools for Turbo Pascal* also contains larger programs with examples of directory handling and sorting routines using string, integer, and pointer keys. The examples of pointer use make this package especially valuable to anyone experimenting with database programming.

Another interesting set of routines handle the redirection or "piping" of I/O in DOS 2.0 and later versions. SYSIN and SYSPRINT use DOS functions 3Fh and 40h to read and write to or from a device in 128-byte blocks. These procedures function in a debugging routine to display registers and flags to the printer. Such pipes can serve in a variety of ways to modify data in any file, or to pipe it to another device such as a printer or a new disk file.

GTP PROGRAM DEVELOPMENT SYSTEM

The *GTP Program Development System* program generator is perhaps the most ambitious Turbo Pascal accessory reviewed here: the program claims to be able to generate a complete database program from a user-supplied data entry screen. Since the output code (and the source code for the program generator itself) is in Turbo Pascal, you can make alterations and additions if needed.

In theory, it's a great idea. As with anything automatic, however, the *GTP* package has its limitations. The maximum size of the data screen is 75 lines, which restricts applications to three data entry screens. You're also restricted to 30 fields in any one database, unless you make considerable modifications in the generated source code. Since the source code for the generator itself is included in the package, a clever programmer could make modifications to bypass these limits. But with all the demands on a typical programmer's time, is it worth it?

GTP is a great package for programmers who need to produce a simple database application in a limited amount of time. It takes less than 15 minutes to generate the complete code for such a simple application, not counting a minimum of 3 to 6 hours of going through the manual to acclimatize yourself to the program's modus operandi. A tutorial script guides you through the steps necessary to generate your first program.

The variable names created by the *GTP* generator look intimidating at first, but a reference skeleton program in the manual helps sort out the names, procedures, and program structure. After you're familiar with the program's logic, you should be able to generate programs quickly and efficiently.

GTP is not the best program for beginners because any type of modification requires some knowledge of Pascal structure. Studying and modifying the program's source code is certainly a valuable experience, but your time could be better spent in writing a database from scratch. The real value of a program generator like *GTP* lies in repeatedly generating routine databases. If you're planning on writing several small to medium-sized databases, it's worth considering.

TURBO-PLUS

Turbo-Plus offers the Turbo Pascal programmer strong support in writing data to the screen, handling input from the keyboard, and manipulating files. Unlike the procedures of other programs in this review, almost all *Turbo-Plus* procedures make external calls to .COM files supplied on the program disk.

Each of the 40 .COM files supplied with *Turbo-Plus* (the .ASM source code is not included with the program) is used in one or more of the function calls in the 15 sample programs. The advantage in using calls to external .COM (binary) files lies in their speed of execution and in the fact that, unlike INCLUDE files with procedures written in Pascal, these files do not have to be recompiled each time you revise the source code.

The functions dealing with screen mapping create impressive screens with much less effort than working in Turbo Pascal would normally require. Final program size is also kept to a minimum. For example, to write a specified string to the screen, you would call FastWrite, a routine that writes the string to the screen and at the same time sets the foreground and

PC MAGAZINE FACT FILE

Tools for Turbo Pascal
Allen, Emerson & Franklin Inc.
P.O. Box 928
Katy, TX 77492
(713) 391-8570
List Price: $29.95
Requires: 96K RAM, one disk drive, Turbo Pascal 2.0 or later, DOS 2.1 or later.
In Short: A basic set of procedures to INCLUDE in your programs. AEFTOOLS could use more documentation, but intermediate-level programmers probably will do fine.
CIRCLE **652** ON READER SERVICE CARD



GTP Program Development System
Allen, Emerson & Franklin Inc.
P.O. Box 928
Katy, TX 77492
(713) 391-8570
List Price: $99.95
Requires: 128K RAM, one disk drive, Turbo Pascal 2.0 or later, DOS 2.0 or later.
In Short: This complete program generator writes an entire database management program, but it needs some knowledgeable "tuning up." Good for intermediate-level programmers.
CIRCLE **651** ON READER SERVICE



Turbo-Plus
Nostradamus Inc.
5320 S. 900 East, #110
Salt Lake City, UT 84117
(801) 261-0769
List Price: $59.95
Requires: 128K RAM, one disk drive, Turbo Pascal 2.0 or later, DOS 2.0 or later.
In Short: A Turbo "power booster" that uses external .COM files to add flexibility but keeps code and programming time small. The documentation is barely adequate, but beginners, with a little practice, will find this set of value.
CIRCLE **649** ON READER SERVICE CARD

background colors and the cursor size all in one operation. Since the string is written directly to the video buffer, it appears on-screen almost instantaneously.

Turbo-Plus's procedures include utilities to reset either screen attributes or text—or both at once. One of the most powerful routines, MapField, can display a message to the screen and accept user input that can be edited and then checked for proper type and syntax. Variations of the MapField function handle strings and real and integer input.

A graphics mode allows you to display characters of varying size while in any of the three standard graphics modes. The RamWindow function, a diagnostic tool, can save the current screen and display a hex/ASCII dump at any point in the program: you can page through memory for information, then restore the cursor and previous screen to continue working with the program.

The small manual is not well laid out; it lacks an index and a comprehensive list of procedures, leaving you to print out and read the sample programs in order to understand how the functions are used.

SCREEN GENIE

Screen Genie is perhaps the easiest-to-use screen generator reviewed here. Program flow is intuitive, and it's easy to make changes in the screen file. An on-line help screen is always available (and may be

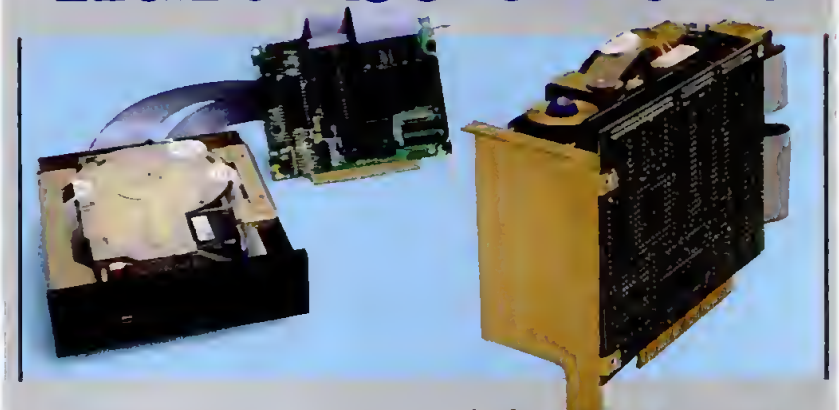
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Screen Genie
Nostradamus Inc.
5320 S. 900 East, #110
Salt Lake City, UT
84117
(801) 261-0769
List Price: $69.95
Requires: 128K RAM, one disk drive, Turbo Pascal 2.0 or later, DOS 2.0 or later.
In Short: An excellent screen editor that combines ease of use with .COM file power. Intermediate-level programming is required to make this work.

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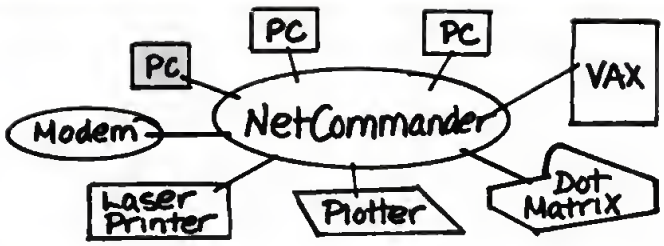
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kept in another drive or path for convenience).

You simply type text on the screen. Borders can consist of any of the 255 possible IBM characters; you can "freeze" a border on the screen while making changes inside its boundaries without jumbling up the edges. Input fields are delimited with a function key. Data entry fields can be set for text, real, or integer input with range checking installed automatically. Once you set up the screen, you can save it to be recalled at a later time.

The next step allows you to generate four different types of files useful in Pascal programming: function calls (to be used with the MapField procedure, which organizes the screen), linkable .OBJ files (for MS Pascal), "callable" .COM files (for Turbo Pascal), or .COM files that can be invoked directly, via a .BAT file, for example.

Screen Genie is not a program generator, but it certainly gives you a quick way to get your input and menu screens working with a minimum of coding time. The manual is small and lacks an index; it is laid out in such a way that it is productive to read the last half before you read the first.

TURBO-SPAWN

One of the Turbo Pascal's severest limitations is its inability to generate programs that use more than 64K bytes of RAM.

PC MAGAZINE FACT FILE



Turbo-Spawn
Nostradamus Inc.
5320 S. 900 East, #110
Salt Lake City, UT
84117
(801) 261-0769
List Price: $39.95
Requires: 128K RAM, one disk drive, Turbo Pascal 2.0 or later.
In Short: *Turbo-Spawn* adds to Turbo Pascal the capability to load and run really big programs. Good for specialized applications when easy access to big memory is important.

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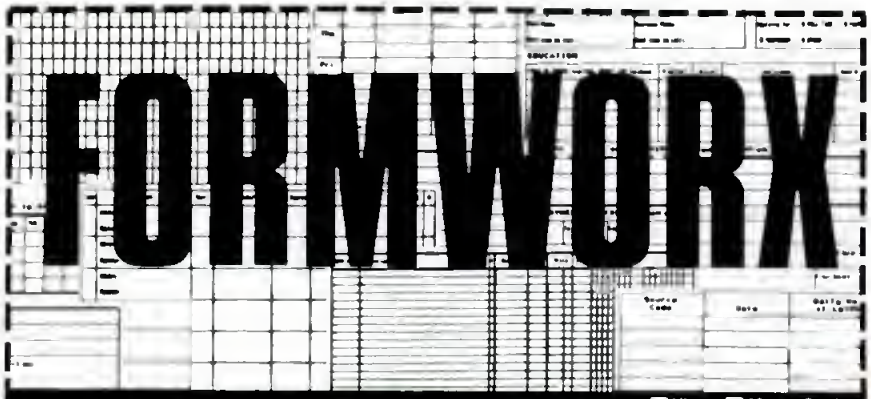
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■ TURBO PASCAL UTILITIES

Turbo-Spawn lets you get around this limitation by providing a "callable" subroutine that can "spawn" another program from within a file produced by the compiler. Parameters can be passed to the new "child" program and returned to the "parent." For example, you could set a program to call *WordStar* and edit a given file by including the *Turbo-Spawn* procedure in your program and passing it the command line "WS sample.fil".

You must size your free dynamic memory to allocate space for running a program spawned by *Turbo-Spawn*. If you don't, the program will not run. The disk includes the subroutine SPAWNOST.COM, as well as the RamWindow routine from Turbo-Plus, to help you correctly set the maximum free dynamic memory in the Turbo Pascal compiler's Options menu.

Three sample programs demonstrate the execution of any other .COM or .EXE file from within a .COM program, as well as parameter-passing operations. Also included are the source code to the sample programs and error codes in case the program to be spawned isn't found or there isn't enough memory to run it from within the parent program.

Turbo-Spawn is supplied without any manual beyond a single data sheet, but that's really all you need to get started. PC

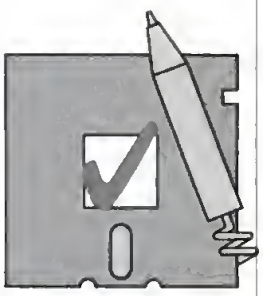
Peter Feldmann is a California-based free-lance writer.

PC MAGAZINE EDITOR'S CHOICE

The reviews in this article cover screen generators, program editors, libraries of routines, and miscellaneous utilities; to compare them collectively is impossible. However, one package stands out as the best support available for Turbo Pascal programmers: Blaise Computing's Turbo Power Tools. This definitive set of prewritten Pascal functions and procedures will make the life of any programmer—from the beginner to the hard-core professional—easier and more productive.

■ **PC LAB NOTES:** DATA BACKUP ■ JOHN DICKINSON

NO BACKUPS MEANS GOING IN REVERSE



Think creating backups is difficult? It's more difficult to recover lost files, so make life easy—make backups!

Backing up the data stored on your hard or floppy disks is one of life's less pleasant chores. But doing it is not nearly so unpleasant as coming up empty when your disk gets accidentally erased, reformatted, smeared with peanut butter and jelly, or otherwise maimed beyond repair.

Most people feel that one extra copy of whatever they're currently working on is enough protection against disaster, but that may not be enough for you. For one thing, it is usually a good idea to maintain an extra archive of old work. You may consider a task to be over and done with (thank goodness!), but your boss may not, and not having an extra copy somewhere can easily come back to haunt you as you try to regenerate your old data.

In addition, many seasoned data processing professionals insist on maintaining at least two, and often more, prior generations of computer work. Most corporations, for example, maintain sufficient backups to "restart" the company financially on any prior day for a month, simulating each day's activity from that date. While that's probably an extreme strategy for most PC users, you might at least consider the value of such an approach for recreating your work.

DISKCOPY FOR FLOPPIES When it comes to backing up floppy disks, DOS's designers did an excellent job. DOS's DISKCOPY command will make a bit-by-bit copy of whatever is stored on a 360K-byte disk, no matter how full or empty it is. If you type

```
A>DISKCOPY B: A:
```

the DISKCOPY command will prompt you to insert the source disk (the one you want to duplicate) in drive B:, and the target (a blank or otherwise unused disk) in drive A:. Don't worry if you haven't formatted the target disk because DISKCOPY includes a version of the FORMAT command that will automatically take care of this. This means that you must be careful, however, never to use a disk that already contains valuable data as your *target*. While it leaves the data on the source disk unmodified, of course, DISKCOPY wipes out whatever information is on the target. If you're a beginner, you might be wise to put a write-protect tab on the disk you want to back up, just in case you mix up which drive is which.

DISKCOPY takes about 1 minute to back up a 360K-byte floppy disk if your machine has sufficient memory (about 448K bytes) to hold the entire contents of the disk. It may take longer on a minimum-memory (256K-byte) machine. DISKCOPY takes about 2 to 3 minutes for the PC AT's 1.2-megabyte disk: the actual time will depend on how agile you are in swapping floppy disks, since you'll probably have to use the same physical drive (A:) alternately for the source and target disks. (Most PC AT users opt for a 360K-byte floppy disk as their second disk drive, and this cannot be used in backing up 1.2-megabyte disks).

■ You may consider a task to be over and done with, but your boss may not, and not having an extra copy can easily come back to haunt you.

THE COPY ALTERNATIVE The DOS COPY command provides sufficient backup in many cases, particularly if all you're currently working on is one or two files. Unlike the bit-by-bit DISKCOPY procedure, COPY makes a discrete copy of each file, using DOS's normal disk utilization strategies. As you add, modify, and delete files on a disk, the physical space available for new files or modifications ceases to be contiguous, resulting in what are called *fragmented* files. These are still fully usable, of course, but because the drive head must repeatedly move around the disk to find the successive parts of the file, operation is slowed.

If your original or backup floppy disk contains fragmented files (you can use CHKDSK [filename] or *The Norton Utilities* to find out), COPY can be used to make an unfragmented, and therefore speedier-to-use, floppy disk. Just use a freshly formatted disk for the target, and every file will be stored in contiguous areas on the disk.

■ PC LAB NOTES

To copy the entire contents of one floppy to another, use

```
A>COPY B:*.* A:
```

You can use wildcards (* and ?) to pare down the list of files to be copied, or you can specify discrete filenames for individual copying. COPY provides no prompting and starts work immediately. If you use wildcards, COPY lets you know what files are being copied and, when it finishes up, how many were copied. COPY takes about 4 minutes to back up a full disk (I clocked 4 minutes, 10 seconds on a disk with 112 files and 0 bytes free).

If you want to make backup copies that are discrete in that only certain files get copied to a particular backup diskette, create a batch file that contains the following command:

```
FOR %%F IN (WC.WC) DO IF EXIST A:%%F COPY B:%%F A:
```

where the letters WC stand for so-called wildcard specifications. (If you issue this command directly from the A> prompt instead of from within a .BAT file, use one percent sign instead of two.) This command will copy files on disk B: to disk A: only if those filenames already exist on disk A: For example, if you want to back up your BASIC programs, but not the copy of the BASICA interpreter you keep on the same disk, you would use

```
FOR %%F IN (*.BAS) IF EXIST A:%%F DO COPY B:%%F A:
```

For an even more discrete strategy, try this FOR loop, which copies only the specific files whose filenames (in this example) are N1, N2, and N3:

```
FOR %%F IN (N1 N2 N3) IF EXIST A:%%F DO COPY B:%%F A:
```

If you want a still more discrete, copy-oriented strategy, you can use BAC .COM, published in the Programming column in Volume 4, Number 17, of *PC Magazine* (page 197), and which is also available by modem from *PC Magazine*'s free Interactive Reader Service (212) 696-0360. BAC.COM will only copy files that have been modified since the last time you copied or backed them up onto the target disk. You can use it alone or with the same FOR loop strategy shown above for the COPY command (just replace the COPY command with BAC).

HARD DISK BACKUP Backing up a hard disk presents an altogether different and more complex problem, one that may end your love affair with the speedy silence of hard disk operation. Hard disks are large enough to allow you to create data files of nearly any size at any time you like. That means it's perfectly reasonable for you to accelerate your hard disk's usage from 0 to 75 percent in a few short hours (I actually hit this figure in the first 3 hours of owning an early PC-XT).

■ Backing up a hard disk presents a different problem, one that may end your love affair with the speedy silence of hard disk operation.

But the technology used in hard disks is inherently shaky: there's a little airplane flying around in there, just waiting for the opportunity to crash and make a mess out of your data. And as many of us have sadly discovered, it's easy for the machinery to zap your usage back to 0 percent in a few short seconds. That means you have more to lose and you can lose it much more quickly when problems arise.

DOS provides two programs designed for backing up and restoring data on hard disks. BACKUP and RESTORE have a reputation for being the weakest members of the DOS family of disk utility commands, but they're not quite as bad as some industry pundits would have you believe.

BACKUP is used to copy one, some, or all files from any directory, subdirectory, subtree of subdirectories, or the entire hard disk onto a series of preformatted floppy disks or onto another hard disk. (DOS versions prior to 3.0 only allow BACKUP to floppy disks.) It includes provisions for limiting the backups only to files that have been modified since the last time BACKUP was run or that have been modified since a date you specify.

To back up your entire hard disk (assume it's drive C:) onto a floppy disk (drive A:), type in the following command:

```
C>BACKUP C:\*.* A:/S
```

BACKUP will start working on your root directory and copy all files and directories. The /S (for subdirectory) option forces it to look into every subdirectory below the one specified (the root) and back up all files and directories stored in them.

If you want to back up only one directory (say, the WP directory), type in the following command:

```
C>BACKUP\WP\*.* A:
```

If you want to include all subdirectories in those subdirectories, add the /S option:

```
C>BACKUP C:\WP\*.* A:/S
```

If you want to get into highly structured generation strategies, use the date option to specify that BACKUP should only make copies of files that have been modified since a specific date. For example, if you change the command above to

```
C>BACKUP C:\WP\*.* A:/S/D:5-16-86
```

only those files modified since May 16, 1986 will be backed up.

In addition, any DOS wildcard specification can be used to pare the list of backed up files down to something meaningful to you. For example, to back up only .DOC files in the WP directory, use

```
C>BACKUP C: \WP\*.DOC A:
```

This does not affect other options, and they may be used as previously described.

BACKUP is actually in one respect a COPY command that has been modified to allow large files to spill over from one floppy disk to the next. That capability makes it critical that you be careful to label each floppy disk used with its BACKUP sequence number.

RESTORING YOUR FILES Unlike the files created by using COPY, files generated by BACKUP cannot be directly pro-

BACKUPS MADE (SOMEWHAT) EASIER

If Murphy were really an optimist, he would trust in the eternal integrity of hard disks.

The third-most-common method of backing up a hard disk—and probably the most effective—is with tape.

The second-most-common method is using floppy disks, which is slow and tedious. This generally leads to the most common method: doing nothing at all beyond trusting in the integrity of hard disks—the closest thing the personal computer industry has to the rhythm method.

Once, all hard disk backups were made on ½-inch, open-reel tapes. You can still buy them and use them for backing up a PC, but most of the units dwarf the PCs they're meant to back up. They're more for the mainframe world.

Backup units for PCs typically use one of three main standards:

- DC 600 ¼-inch tape cartridges that are about 4×6×⅝ inches (about the size of a videocassette) and descended from the minicomputer world.
- DC 1000 minicartridges that are slightly larger than 2×3×½ inches and use .150-inch tape. That's the same tape width as audio cassette tape.
- DC 2000 minicartridges that are the same physical size as the DC 1000 but use ¼-inch tape.

Reliability comparable to the more-established formats is claimed by two competing technologies: digital cassettes and single-reel tape.

It's also possible to make a backup using a standard videocassette recorder equipped with a special controller.

Iomega's Bernoulli Boxes, which function as alternatives to hard disks, work well as backup devices because they're equipped with removable cartridges. They're not cheap, but the people who have them swear by them.

Just coming to market are Write Once, Read Mostly (WORM) optical disks for archival backups. They look like compact audio disks in a plastic case with a sliding steel shutter.

In many cases, a backup made on one brand system can only be restored using the same model.

EDITOR'S CHOICE: SYSGEN In a recent test of 13 tape backup units ("Tape Backup: Measuring Speed & Cost per Megabyte," *PC Magazine*, Volume 5 Number 3), the units that fared best weren't necessarily the ones that were fastest or cost least per megabyte, but the ones with the best software.

The *PC Magazine* Editor's Choice was the **Sysgen QIC-File**, which starts automatically at bootup and works in the background, using criteria you establish. Second choice was the **Genoa Galaxy 3260**, which combined low cost per megabyte with a good user interface.

Of the units listed in the Fact Files for this column, most include their own software. Also listed are several standalone software products that, according to their makers, can be used to back up hard disks to floppy disks with fewer hassles than using the DOS COPY or BACKUP/RESTORE commands.

Tape backups can be either a file-by-file system or a mirror-image—sometimes called bit image—system, which captures the contents of a drive as one long stream of data. With mirror-image systems, you can't restore just one file, although some file-by-file systems or a combined system let you do both.

Before you begin to make a backup, note that some copy-protected programs that are "hard-disk installable" may be rendered unworkable by the backup/restore process. (Some are unaffected by mirror-image backups only.) If so, be sure to uninstall those programs, or, if possible, have the software avoid those files.—**Bill Howard**

cessed through regular DOS procedures. Before they can be used, BACKUP files must be run through the complementary RESTORE procedure, and if you're not careful to maintain the original sequence, RESTORE will be unable to put your files back onto your hard disk.

BACKUP prompts you with the sequence number as it requests new floppy disks to be inserted into the drive. My own strategy includes using the LABEL command to give each floppy a volume label with a sequence number that you can match to the one used by BACKUP as it goes along. It also helps make things go more smoothly, of course, to use the same number on an external label.

■ The technology used in hard disks is inherently shaky: there's a little airplane flying around in there, just waiting for the opportunity to crash.

RESTORE is BACKUP's companion for bringing trashed files on your hard disk back to life. You can use it to restore only a particular file or group of files to a subdirectory, to restore a whole subdirectory or subtree of subdirectories, or to restore the entire disk. You can limit it to restoring only those files that have been modified since BACKUP was run or to restore all files.

BACK FROM THE FLOPPIES To restore all the files in all directories onto the hard disk (disk C:) from your floppies (on drive A:), type

```
C>RESTORE A: C:\*.*/S
```

The /S option is identical to the one in the BACKUP command. You can restore only a single directory or include its subdirectories by specifying it on the command line. To restore the WP directory and its subdirectories, you would enter

■ PC LAB NOTES

PC MAGAZINE FACT FILE

HARDWARE

TG-1020i, TG-1020e, TG-2025i, TG-2025e, TG-4060, TG-5025, TG-6135, TG-6150, TG-6180.
Tallgrass Technologies Corp.; 11100 West 82d St.; Overland Park, KS 66214; (913) 492-6002.
List Price: TG-1020i, $995; TG-1020e, $1,295; TG-4060, $1,995; TG-2025i, $1,995; TG-2025e, $2,295; TG-5025, $3,495; TG-6135, $4,495; TG-6150, $5,495; TG-6180, $7,495.
In Short: TG-1020i, TG-1020e are internal, external 20-Mbyte units using DC 2000 cartridges supporting mirror-image and file-by-file backup. TG-2025i, TG-2025e are internal, external 25-Mbyte hard disks with 20-Mbyte tape backup using DC 2000 cartridges. TG-4060 is an external tape backup using DC 600 cartridges with 60-Mbyte capacity. TG-5025, TG-6135, TG-6150, TG-6180 are hard disks with 60-Mbyte DC 600 cartridge tape backup.
CIRCLE **639** ON READER SERVICE CARD

120, 145, 210, 220, 225, 245
Irwin Magnetics Corp.; 2311 Green Rd.; Ann Arbor, MI 48105; (313) 996-3300.
List Price: To be announced
In Short: All are internal units. For PC, PC-XT: 120, 20-Mbyte DC 2000; 210, 10-Mbyte DC 1000 half-height; 220, 20-Mbyte DC 2000 half-height. For PC AT: 145, 40-Mbyte DC 2000; 225, 20-Mbyte DC 1000 half-height; 245, 40-Mbyte DC 2000 half-height.
CIRCLE **638** ON READER SERVICE CARD

Maynstream 20, Maynstream 60
Maynard Electronics; 460 Semoran Blvd; Casselberry, FL 32707; (305) 331-6402.
List Price: Maynstream 20 internal, $1,299; Maynstream 20 external, $1,595; Maynstream 60 internal, $1,745; Maynstream 60 external, $2,095.
In Short: The Maynstream 20 internal has 20-Mbyte file-by-file backup on a half-height cassette drive; external has the same specs. Maynstream 60 offers 60-Mbyte file-by-file backup on a DC 600A cartridge; the internal version is full-height.
CIRCLE **637** ON READER SERVICE CARD

TD-440, 552 Data Library, 532 Data Library, 552D
Advanced Digital Information Corp.; P.O. Box 2996; Redmond, WA 98073; (206) 881-8004, (800) 638-0818.
List Price: TD-440, $1,490 ($1,640 with network archival software); 552 Data Library, $4,500; 532 Data Library, $2,900 internal, $3,450 external; 552D, $5,450 external.
In Short: TD-440 is a 40-Mbyte DC 2000 external unit. 552 Data Library is an external 67-Mbyte unit using DC 600HC cartridges. 532 also uses DC 600HC cartridge, 67-Mbyte capacity. 552D is dual tape drive, 134-Mbyte total storage on two DC 600HC tapes.
CIRCLE **636** ON READER SERVICE CARD

CT 60i, CT 60e
Core International; 7171 N. Federal Hwy.; Boca Raton, FL 33431; (305) 997-6044.
List Price: CT 60i, $1,795; CT 60e, $2,295.
In Short: Both units allow 60-Mbyte backup on a DC 600 tape using mirror-image or file-by-file backup.
CIRCLE **635** ON READER SERVICE CARD

Smart QIC-File, Smart Image, Flat-Pack, AT Add-In, Sysgen Plus
Sysgen Inc.; 47853 Warm Springs Blvd.; Fremont, CA 94539; (415) 490-6770, (800) 821-2151.
List Price: Smart QIC-File, $1,495; Smart Image internal, $795; Smart Image external, $895; Flat-Pack, from $1,395 to $2,095; AT Add-In, from $2,095 to $4,995; Sysgen Plus, from $3,695 to $5,995.
In Short: All feature automatic backup. Smart Image is half-height 20-Mbyte digital data cassette D/CAS-6, and Smart QIC-File is half-height 60 Mbytes on DC 600A cartridge. The Flat-Pack externals offer 10-Mbyte hard disk and 20-Mbyte streaming cassette, 20-Mbyte hard disk and 20-Mbyte cassette, or 20-Mbyte hard disk with 60-Mbyte QIC-24 cartridge. The AT Add-In has 20-, 30-, or 70-Mbyte hard disks with 60-Mbyte QIC-24 tape backup. The Sysgen Plus is an external unit with its own power supply and 30- or 70-Mbyte hard disk with a 60-Mbyte QIC-24 tape backup. All Sysgen units offer mirror-image or file-by-file backup.
CIRCLE **634** ON READER SERVICE CARD

ORT-0010, SWS-0027, SWS-0060
Sigma Designs Inc.; 2023 O'Toole Ave.; San Jose, CA 95131; (408) 435-1480.
List Price: ORT-0010, $945; SWS-0027, $1,195; SWS-0060, $1,595.
In Short: The ORT-0010 unit uses a self-threading one-reel tape to back up 10 Mbytes of data per reel. The SWS-0027 will back up 20 Mbytes using TEAC CT 500 or Maxell CS 500 cartridges and can back up 27 Mbytes using CT 600 or CS 600 tapes. SWS-0060 can back up 60 Mbytes on a DC 600A cartridge or 45 Mbytes using a DC 300XL tape.
CIRCLE **633** ON READER SERVICE CARD

Internal Tape Backup System, MMT-27, MMT-60, Filesafe System Complete, Series 7000 External Tape System
Mountain Computer Inc.; 360 El Pueblo Rd.; Scotts Valley, CA 95066; (408) 438-6650, (800) 458-0300.
List Price: Internal Tape Backup System: 27 Mbytes, $1,495, 60 Mbytes, $1,595; MMT-27, $1,595; MMT-60, $1,695; Filesafe System Complete: 27 Mbytes, $1,695, 60 Mbytes, $1,895; Series 7000 External Tape System, $1,995; 4.0 Tape Software, $149.
In Short: Filesafe System Complete offers 27 Mbytes or 60 Mbytes on a DC 600A cartridge for the PC, XT, or AT with mirror-image backup only; software is available for file-by-file backup. The MMT-27 and MMT-60 are external tape backups for the AT and use the DC 600A cartridge for mirror-image backup. Internal Tape Backup System is a half-heigbt for the AT with 27 Mbytes or 60 Mbytes on a DC 600A cartridge by mirror image. The Series 7000 is a zero footprint series that fits next to the monitor of the PC, XT, or AT with 60-Mbyte capacity on DC 600A cartridge by mirror-image or file-by-file backup.
CIRCLE **632** ON READER SERVICE CARD

LI-60685
Lintec Inc.; P.O. Box 2381; Saratoga, CA 95070; (408) 370-7400, (800) 621-0854 ext 925.
List Price: $895
In Short: A 60-Mbyte unit that uses DC 600A tape cartridge for mirror-image or file-by-file backup.
CIRCLE **631** ON READER SERVICE CARD

I^2TAP10, I^2TAP45X
I^2 Interface Inc.; 21101 Osborne St.; Canoga Park, CA 91304; (818) 341-7914.
List Price: I^2TAP10, $995; I^2TAP45X, $1,795.
In Short: The I^2TAP10 and I^2TAP45X are both external units. The I^2TAP10 backs up 10 Mbytes on a DC 1000 or TC 200 cartridge using both mirror-image and file-by-file backup, and the I^2TAP45X performs image-only backup onto DC 300XL cartridges.
CIRCLE **630** ON READER SERVICE CARD

Diskit T60 IDEAdisk
IDEAssociates Inc.; 35 Dunham Rd.; Billerica, MA 01821; (617) 663-6878.
List Price: Diskit, $1,975; IDEAdisk, from $3,395 to $9,195.
In Short: The internal Diskit T60 drive backs up 60 Mbytes onto a DC 600A cartridge and is available in both PC-XT and AT configurations. The IDEAdisk is an external hard disk/tape backup subsystem. Hard disk sizes range from 20 to 120 Mbytes, with a choice of either 20- or 40-Mbyte DC 600A tape drives. Both units support both file-by-file and image backup.
CIRCLE **629** ON READER SERVICE CARD

PC MAGAZINE FACT FILE

FT-60, PC-QICTAPE, QICSTOR-PLUS
Alloy Computer Products Inc.; 100 Pennsylvania Ave.; Framingham, MA 01701; (617) 875-6100.
List Price: FT-60, $995 ($3,295 with 20-Mbyte hard disk, $4,295 with 41-Mbyte hard disk); PC-QICTAPE, $2,295 (30-Mbyte hard disk, $4,595; 40-Mbyte hard disk, $5,295; 60-Mbyte hard disk, $6,795; 67-Mbyte hard disk, $7,295; 80-Mbyte hard disk, $7,995; 110-Mbyte hard disk, $9,995; 134-Mbyte hard disk, $10,295; 220-Mbyte hard disk, $15,995); QICSTOR-PLUS (with 30-Mbyte hard disk, $5,595; 40-Mbyte hard disk, $6,595; 67-Mbyte hard disk, $8,295; and 110-Mbyte hard disk, $10,995); FTFA controller card, $195.
In Short: All the Alloy products are external FT-60 streaming file-oriented units using DC 600A 1/4-inch cartridges for 60 Mbytes of both file-by-file and mirror-image backup. An FTFA controller card is needed for ATs. A 20- or 41-Mbyte hard disk is optional. PC-QICTAPE is a LAN-compatible tape backup/hard disk combination with a QIC-2 controller and comes with the choice of 30-, 40-, 60-, 67-, 80-, 110-, 134-, and 220-Mbyte hard disk configurations. QICSTOR PLUS has the QIC-2 controller, has possible hard disk configurations of 30, 40, 67, and 110 Mbytes, and includes five IBM-compatible expansion slots.
CIRCLE **628** ON READER SERVICE CARD

AST 4000
AST Research Inc.; 2121 Alton Ave.; Irvine, CA 92714; (714) 863-1333.
List Price: $7,499.
In Short: Formerly called Colossus, the external 60-Mbyte tape backup/74-Mbyte hard disk combination uses SCSC technology and has the capacity for up to two hard disk expansion units. It includes the adapter card and does both mirror-image and file-by-file backup.
CIRCLE **627** ON READER SERVICE CARD

Model 5210
Cipher Data Products Inc.; 10225 Willow Creek Rd.; P.O. Box 85170; San Diego, CA 92138; (619) 578-9100.
List Price: $1,095; for PC AT, $1,195.
In Short: Offers 25 Mbytes of file-by-file or mirror-image tape backup as well as nine-track reel-to-reel backup using DC 600A 1/4-inch cartridges; external includes adapter card for ATs and compatibles.
CIRCLE **626** ON READER SERVICE CARD

Targa 1, Targa 2, Targa 3
Kanata Technical Ventures Inc.; 3129 Coronation Ct.; Clearbrook, British Columbia; Canada V2T4J7; (604) 852-3842.
List Price: Targa 1, $2,100; Targa 2, $4,438; Targa 3 (price not yet announced).
In Short: Targa 1 offers external 60 Mbytes of file-by-file or mirror-image tape backup using 1/4-inch DC 600A cartridges. Includes controller, host adapter board, and an SCSI host adapter board. Targa 2 has the same configuration and a 33-Mbyte hard disk. Targa 3 has the same configuration as Targa 2 plus five IBM-compatible expansion slots.
CIRCLE **625** ON READER SERVICE CARD

QIC60
Tecmar Inc.; 6225 Cochran Rd.; Solon, OH 44139; (216) 349-0600.
List Price: QIC60, $2,144 (with 20-Mbyte hard disk, $3,495).
In Short: External 60-Mbyte tape backup using 1/4-inch DC 600A cartridges. Does both file-by-file and mirror-image backup. It has the option of a 20-Mbyte hard disk and includes the host adapter card.
CIRCLE **624** ON READER SERVICE CARD

2000 PC
Digi-Data Corp.; 8580 Dorsey Run Rd.; Jessup, MD 20794; (301) 498-0200.
List Price: $3,995
In Short: An external 40-Mbyte tape backup using half-inch tape for both file-by-file and mirror-image backup. The 2000 PC includes a controller card for ATs and compatibles.
CIRCLE **623** ON READER SERVICE CARD

Javelin ED2/T
Emulex Corp.; 3545 Harbor Blvd.; P.O. Box 6725; Costa Mesa, CA 92626; (714) 662-5600.
List Price: $2,750 (with 41-Mbyte hard disk, $5,495; with 67-Mbyte hard disk, $7,530; with 110-Mbyte hard disk, $9,435); IB02 host adapter, $395.
In Short: External with 60-Mbyte streaming tape drive using the 1/4-inch DC 600A cartridge. It does both mirror-image and file-by-file backup and has 41-, 67-, and 110-Mbyte hard disk options. The host adapter (IB02) is required for operation.
CIRCLE **622** ON READER SERVICE CARD

Stream 60-8, Stream 60, Stream 20, EXLL 20/20
Everex Systems Corp.; 48431 Milmont Dr.; Freemont, CA 94539; (415) 498-1111.
List Price: Stream 60-8, $995; Stream 60, $1,345 (external, $1,595; with QIC 02 and floppy controller, $1,645 external and $1,395 internal); Stream 20, $995; EXLL 20/20, $2,695.
In Short: The Stream 60-8 is an external 60-Mbyte-capacity external streaming tape that uses the DC 600A cartridges for mirror-image or file-by-file backup. It has a file-by-file restoration from image-backup feature. The Stream 60 is an internal or external configuration of the Stream 60-8 and includes a controller card and the option for a QIC 02 and floppy controller. The Stream 20 also offers 60-Mbyte tape backup, but on a cassette tape with QIC 02 and a floppy controller. The EXLL 20/20 is an external combination of the Stream 20, a 20-Mbyte hard disk, and four additional IBM-compatible slots.
CIRCLE **621** ON READER SERVICE CARD

Galaxy 3220T, Galaxy 3260
Genoa Systems Corp.; 73 E. Trimbell Rd.; San Jose, CA 95131; (408) 945-9720.
List Price: Galaxy 3220T, $1,095; Galaxy 3260, $1,400; controller card, $179.
In Short: The Galaxy 3220T is a 20-Mbyte tape backup using the TEAC CT 450 or CT 500 cassette and can do either mirror-image or file-by-file backup. The controller is required for ATs and compatibles. The Galaxy 3260 has a 60-Mbyte capacity and uses 1/4-inch DC 600A cartridges for either mirror-image or file-by-file backup.
CIRCLE **620** ON READER SERVICE CARD

HP9142A
Hewlett-Packard Co.; 10520 Ridgeview Ct.; Cupertino, CA 95014; (415) 857-1571.
List Price: $1,990; 15-Mbyte tapes (5), $129; 60-Mbyte tapes (5), $180.
In Short: Offering either 15- or 60-Mbyte tape backup system using 1/4-inch DC 600A cartridges, the HP9142A does both file-by-file and mirror-image backup.
CIRCLE **819** ON READER SERVICE CARD

Videotrax
Alpha Micro; 3501 Sunflower; P.O Box 25059; Santa Ana, CA 92799; (714) 957-8500.
List Price: Controller, $795; VCR, $800.
In Short. An 80-Mbyte videotape backup system with mirror-image and file-by-file software options; it can be used with any VCR or optional Alpha Micro unit.
CIRCLE **818** ON READER SERVICE CARD

BP 100+, BP 25+
Portable Solutions/BackPac International Corp.; 1701 Directors Blvd., #250; Austin, TX 78744; (512) 448-4965.
List Price: BP 100+, $4,495; BP 25+, $1,295.
In Short: The BP 25+ has a 25-Mbyte hard disk with 20-Mbyte tape backup on TEAC CT 450 cassette using file-by-file backup. BP 100+ is a WORM optical disk using LitePac preformatted, 100-Mbyte optical disk cartridges. Both units are portable and are meant to be carried to several PCs for installing backup use.
CIRCLE **617** ON READER SERVICE CARD

(Fact File ends)

■ PC LAB NOTES

```
C:>RESTORE A: C:\WP\*.*/S
```

This will work even if your original BACKUP command backed up the entire disk. RESTORE will search through the floppy disks (provided you feed them in in the correct, original sequence) until it finds the WP data and restores it. You can specify a particular filename or use wildcards in any way you want, such as to specify a particular filename extension. To restore only .DOC files in the WP directory, type:

```
C>RESTORE A: C:\WP\*.DOC
```

RESTORE has one additional feature that can be handy if you have an application that works with a large number of files at once. If those files happen to be ruined by a bad session with the program, you can use RESTORE to bring back only files modified since BACKUP was run by using the /P option. For example,

```
C>RESTORE A: C:\WP\*.DOC/P
```

will restore only those .DOC files that have been modified.

TAKING YOUR TIME BACKUP and RESTORE are generally slow to run. For example, it takes over a half an hour to back up a 10-megabyte hard disk on a PC-XT. The process also takes about 30 floppy disks (both numbers depend on how full the hard disk is when you back it up). RESTORE takes about the same amount of time to run.

Both commands run somewhat faster on a PC AT when you use the high-capacity (1.2-megabyte) floppy disk drive as the backup device. However, because of the flakiness of much of the 1.2-megabyte media on the market, you should consider slowing things down by using the VERIFY ON command to ensure that all data gets recorded correctly. (Indeed, if your hard disk data is critical, you should consider using VERIFY ON for backing up no matter what type of disk you use.)

BACKUP and RESTORE's biggest flaws are their slow speed and their requirement that you preformat the floppy disks you're using. An annoying deficiency of RESTORE is that it will not recreate a directory on your hard disk. You must create it yourself before running the command, but usually this is a problem only if you're replacing the entire hard disk.

But DOS's commands are reliable, especially if you use the VERIFY ON command to ensure data integrity. I've been able to recover from five PC AT hard disk failures using BACKUP and RESTORE on 1.2-megabyte floppy disks, and had only minor problems doing it.

IS THAT ALL? Other hard disk backup strategies are available, and some of them offer significant performance advantages. Naturally, they all cost extra (BACKUP and RESTORE have the redeeming quality that they come packaged with DOS) because they require extra hardware, software, or both.

Contributing editor Winn Rosch always thinks big, and backing up hard disks is no exception. "Just get another one," he tells me, and at today's hard disk prices it's not a difficult strategy to pursue. DOS 3.0/3.1 allows you to use BACKUP and RESTORE with another hard disk, but discrete use of COPY or BAC is probably a better alternative, especially if the second drive has a lower capacity than the original. (BACKUP will not use a second hard disk drive when it runs out of room on the first one.)

Iomega's Bernoulli Box is a perennial favorite when it comes to dual disk strategies because most models include two drives from the start. The company has always provided a bit-image copy command (ICOPY) to maintain two of its oversized floppy disks, and more recent versions of its utilities include IBACKUP and IRESTORE, which can be used to back up any type of disk onto any other, even if the target is smaller.

Tape backup systems have recently come down in price, making them more attractive for backup than they once were. Two strategies are generally used with tape: a bit-image copy of the entire disk onto the tape (like DISKCOPY makes on floppies), and file-by-file backup, which makes copies of individual files (like the COPY command). Strategic options for your backup procedure will depend on the software delivered with the tape unit.

Several software products that replace BACKUP and RESTORE have come on the market in the last year or so. They are generally inexpensive and offer better performance, a better user interface, use fewer floppy disks, or have some other twist that gives them an advantage over BACKUP and RESTORE.

Whatever strategy you adopt, be sure to back up your data. Magnetic media is not as fragile as it once was, but it's more fragile than the encyclopedia on your bookshelf or even the daily paper. Besides, it's your work—and it's not fun to have to do it all over again.

PC MAGAZINE FACT FILE

SOFTWARE

Fastback
Fifth Generation Systems; 7942 Picardy Ave.; Baton Rouge, LA 70809; (504) 767-0075.
List Price: $179
In Short: Software to back up a 10-Mbyte hard disk in 8 minutes. Copy protected.
CIRCLE **616** ON READER SERVICE CARD

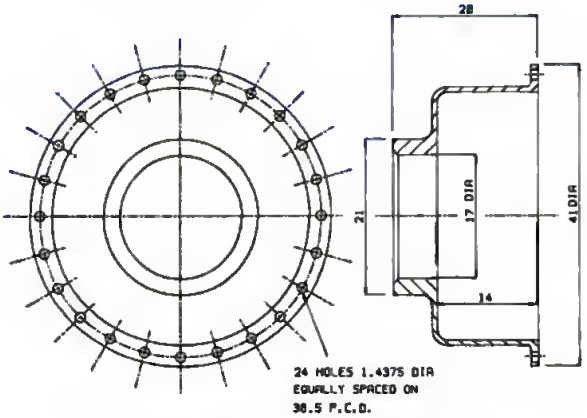
BackTrack
Tallgrass Technologies Corp.; 11100 West 82d St.; Overland Park, KS 62214; (913) 492-6002.
List Price: $179; backup copy of distribution disk, $10
In Short: Automatic hard disk backup program for use with Tallgrass systems or alone. Starts when computer is turned on, operates at specific times or whenever PC is idle. Copy protected.
CIRCLE **615** ON READER SERVICE CARD

DataCare
Ellicott Software Inc.; 3777 Plum Hill Ct.; Ellicott City, MD 21043; (301) 465-2690.
List Price: $129
In Short: A program for simplified backups on floppy disks by full, subdirectory, or file-oriented backup.
CIRCLE **614** ON READER SERVICE CARD

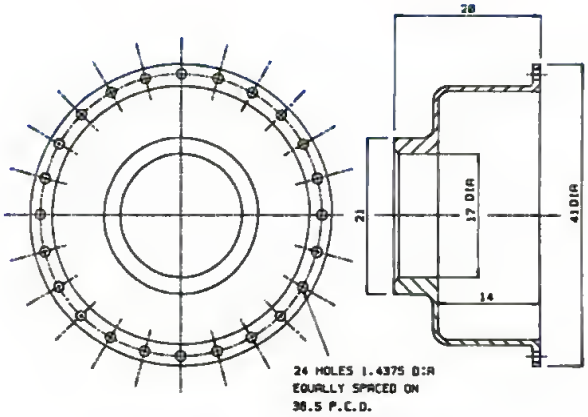
Bakup
Software Integration Inc.; 9800 South Sepulveda Blvd., #310; Los Angeles, CA 90045; (213) 776-3404.
List Price: $179.95
In Short: Automatically backs up hard disk to floppies, file-oriented tape, or removable cartridge drives.
CIRCLE **613** ON READER SERVICE CARD

(Fact File continues)

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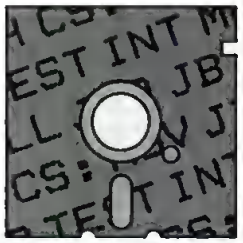
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CIRCLE 123 ON READER SERVICE CARD

■ PROGRAMMING/UTILITIES ■ CHARLES PETZOLD

CHANGING DOS FILE ATTRIBUTES



PC-DOS's ATTRIB utility lets you change only the Read-Only attribute bit. ATTR.COM gives you access to the other attributes as well.

Most DOS users have heard of, but are generally unfamiliar with, file attributes. Even in the DOS *Technical Reference* manuals the subject gets only about a page of discussion. Not until Version 3.0 were any PC-DOS utilities provided to view or change them. Yet file attributes are more important and useful than you might assume.

The ATTRIB program included with PC-DOS 3.0 has a name that implies it is a complete file attribute utility. That name is deceptive, for ATTRIB allows you to change only the Read-Only file attribute. The other file attributes remain as elusive as ever.

I wrote ATTR to fill in this gap. ATTR is as complete a file attribute utility as DOS function calls allow. ATTR does everything ATTRIB does, and more. (By the way, you may be surprised to find that the PC-DOS ATTRIB program is a 15K .EXE file, while ATTR is only a 600-odd byte .COM file. I was also puzzled by this until I figured out that Microsoft wrote ATTRIB in C rather than in assembly language, like most of the other DOS utilities. Yes, even with C you pay a substantial price for the convenience of using a high-level language.)

If you don't know what file attributes are, stay tuned. We'll be learning about them, how DOS uses them, how to change them through DOS function calls, and (with ATTR) what they're good for.

GETTING A COPY ATTR is freely available for individual, noncommercial use, and you can get a copy of it in a vari-

```
;       ATTR.ASM -- File Attribute Utility
;       ==================================

CSEG            Segment
                Assume  CS:CSEG, DS:CSEG, ES:CSEG, SS:CSEG
                Org     0080h
Parameter       Label   Byte            ; Parameter is here
                Org     0100h
Entry:          Jmp     Begin           ; Entry Point

;       Most Data (some more at end of program)
;       ---------------------------------------

                db      "ATTR (C) 1986, Ziff-Davis Publishing Co.",1Ah
                db      " Programmed by Charles Petzold ",1Ah
SyntaxMsg       db      "Syntax: ATTR [+A|-A] [+S|-S] [+H|-H] [+R|-R] "
                db      "[drive:][path]filename",13,10
                db      "                Archive System  Hidden  Read-Only$"
DosVersMsg      db      "ATTR: Needs DOS 2.0 +$"
FlagErrMsg      db      "ATTR: Incorrect flag$"
FileSpecMsg     db      "ATTR: Incorrect File Spec$"
Delimiters      db      9," ,;=",13
FlagList        db      "ASHR", 20h, 04h, 02h, 01h
AllFlagList     db      "    $Arc $Dir $$$$$$Sys $Hid $R-O$"
ChangeFlag      db      0
AndAttrByte     db      0
OrAttrByte      db      0
SearchString    dw      ?
AppendFileName  dw      ?

;       Check DOS Version
;       -----------------

Begin:          Mov     AH,30h                  ; Check for DOS Version
                Int     21h                     ;   through DOS call
                Cmp     AL, 2                   ; See if it's 2.0 or above
                Jae     DosVersOK               ; If so, continue

                Mov     DX, Offset DosVersMsg   ; Error message
ErrorExit:      Mov     AH, 9                   ; Print String function call
                Int     21h                     ; Do it
                Int     20h                     ; And exit prematurely

;       Parse Command Line to get file specification
;       --------------------------------------------

DosVersOK:      Mov     SI, 1+Offset Parameter  ; Parameter string pointer
                Cld                             ; Directions forward

FlagSearch:     Lodsb                           ; Get Byte
                Mov     DI, Offset Delimiters   ; Check if delimiter
                Mov     CX, 5                   ; Five delimiters to check
                Repne   Scasb                   ; Scan the string
                Je      FlagSearch              ; If delimiter, circle back
                Mov     DX, Offset SyntaxMsg    ; Possible error msg
                Cmp     AL, 13                  ; If carriage return, no file
                Je      ErrorExit               ;   so exit with message

                Mov     DI, Offset OrAttrByte   ; Pointer to plus flag saver
                Cmp     AL, '+'                 ; See if plus sign
```

(Figure 1 continues)

Figure 1: *The assembly language program for ATTR.COM.*

ety of ways. Probably the easiest method is by calling *PC Magazine*'s Interactive Reader Service, at (212) 696-0360, with your modem. [*You can use 1,200 or 300 bps and you should set up for 8 data bits, 1 stop bit, no parity—Ed.*] You can then download ATTR.COM (which is the executable file), using the Xmodem protocol. If your communications software does not support Xmodem, you can download ATTR.ASC, instead. Rename that file to ATTR.BAS, load it into BASICA, and run it once. This will automatically create ATTR.COM for you. Alternatively, you can download ATTR.ASM and use the IBM or Microsoft Macro Assembler to create ATTR.COM by entering the following commands:

```
MASM ATTR ;
LINK ATTR ;
EXE2BIN ATTR ATTR.COM
```

Ignore the "No stack segment" message from LINK, but any other error messages indicate a transmission problem.

If you don't have a modem, you can create the ATTR.ASM file yourself from Figure 1. MASM, LINK, and EXE2BIN it as indicated above. No modem or Macro Assembler? Sorry, but you'll have to type the BASIC listing shown in Figure 2 into BASICA and run it to create the ATTR.COM executable file. Use the same line numbers, so the program can tell you about any errors you may have made while typing in those DATA statements.

FILE ATTRIBUTES: A BRIEF TUTORIAL Before I show you how to drive ATTR around your disk, let me take you through a little course on file attributes, so you'll know what you're doing and won't run into a tree.

When DOS creates a file on your disk, it uses the directory entry to save some important information about the file. This information includes the name of the file, the time and date it is created (or last modified), the size of the file, and a pointer indicating where the beginning of the file is stored on the disk. The directory entry for each file also contains a "file attribute" byte. This byte has 8 bits, as shown here:

```
Bits:  7 6 5 4 3 2 1 0
       X X A D V S H R
```

```
                Je      PlusDrMinus             ; If so, save the bit
                Mov     DI, Offset AndAttrBits  ; Pointer to minus fleg sever
                Cmp     AL, '-'                 ; See if minus sign
                Jne     MustSeFile              ; If not, it must be file name

PlusOrMinus:    Mov     [ChangeFleg],-1         ; Set for changing
                Lodsb                           ; Get the next byte
                And     AL, 0DFh                ; Capitalise it
                Mov     BX, Offset FlegList     ; List for scanning
                Mov     CX, 4                   ; Scan for A, S, H, and R

SeerchList:     Cmp     AL, [BX]                ; See if e match
                Js      FoundFleg               ; If so, proceed to save
                Inc     BX                      ; Kick up pointer
                Loop    SeerchList              ; And loop eround for nest
                Mov     DX, Offset FlegErrMsg   ; Otherwise, set meesege
                Jmp     ErrorExit               ; And terminate

FoundFleg:      Mov     AL, [BX + 4]            ; Get bit mask
                Or      [DI], AL                ; Turn saved bit on
                Jmp     FlagSeercb              ; And continue looking

MustSeFile:     Not     [AndAttrBits]           ; Invert bits for turn off
                Mov     [SeerchString], SI      ; Seve file name pointer
                Dec ,   [SeerchString]          ; Actuelly one byte lower

EndSeerch:      Lodsb                           ; Get Byte
                Mov     DI, Offset Delimitere   ; Check if delimiter
                Mov     CX, 6                   ; Bis delimitere including CR
                Repne   Scasb                   ; Scen the string
                Jne     EndSeerch               ; If not delimiter, keep going

;       Trenefer Seercb String down et end of program
;       ---------------------------------------------

                Dec     BI                      ; Points after file spec
                Mov     Byte Ptr [EI], 0        ; Meke it ASCIIZ string
                Mov     CX, SI                  ; CX pointe to end
                Mov     EI, [SearchString]      ; SI points to beginning
                Sub     CX, SI                  ; Now CX is lengtb of it
                Mov     DI, Offset PathAndFile  ; Destination of string
                Mov     [AppendFileName], DI    ; Seve it here also

SearchTrens:    Lodeb                           ; Get byte of seercb string
                Stoeb                           ; And save it down below
                Cmp     AL, ':'                 ; See if drive marker
                Je      PoseibleEnd             ; If so, take note of it
                Cmp     AL, '\'                 ; See if path separetor
                Jne     SextCharecter           ; If not, skip nest oode
PossibleEnd:    Mov     [AppendFileName], DI    ; Tbis is the new end
SextCharacter:  Loop    SearchTrens             ; Do it egein until done

;       Find Files from Search String
;       -----------------------------

                Mov     DX, Offset DTABuffer    ; Set File Find buffer
                Mov     AH, 1Ah                 ;   by celling DOS
                Int     21h

                Mov     DX, [SeerchString]      ; Seercb string
                Mov     CX, 16h                 ; Search Everytbing
                Mov     AH, 4Eh                 ; Find first file

FindFile:       Int     21h                     ; Call DOS to find File
                Jnc     Continue                ; If no error oontinue
                Cmp     AX, 18                  ; If not "no more filee" error
                Jns     FindError               ;   print error meesage
                Jmp     NoMoreFiles             ; Now get oot of the loop

FindError:      Mov     DX, Offset FileSpecMsg  ; Error meesege for file spec
                Jmp     ErrorExit               ; Exit and print meseege

Continue:       Mov     EI, 30+Offset DTABuffer ; Points to filename
                Cmp     Byte Ptr [EI], '.'      ; Eee if "dot" entry
                Jns     FileIsOK                ; If not, oontinue
                Jmp     FindSextFile            ; If so, ekip it

FileIsOK:       Mov     DI, [AppendFileName]    ; Destination of file name
                Mov     CX, 14                  ; Number of bytes to displey

TransferName:   Lodsb                           ; Get the byte in file name
                Stosb                           ; Seve it
                Or      AL, AL                  ; Eee if terminating xero
                Js      PedWithBlanks           ; If so, displey blanke
                Call    DispleyCher             ; Displey the cherecter
                Loop    TransferName            ; And loop back eround
```

(Figure 1 continues)

```
PsdWithBlanks:  Mov     AL, ' '                 ; Psd names witb blanks
                Call    DisplsyChsr
                Loop    PsdWithBlsnks           ; And loop until CX is ssro

;       Chsngs And Displsy Pils Attributes
;       ----------------------------------

                Mov     DX, Offsst PsthAndPils  ; Points to ASCIIZ string
                Test    [CbangsFlsg], -1        ; Sss if changing sttributes
                Js      DisplsyIt               ; If not, just displsy them

                Mov     AX, 4300h               ; Get fils sttributs
                Int     21b                     ;   by calling DOS
                And     CL, 27h                 ; Izro out soms bits
                And     CL, [AndAttrBits]       ; Turn off soms bits
                Or      CL, [OrAttrBits]        ; Turn on some bits
                Mov     AX, 4301h               ; Set fils sttributs
                Int     21h                     ;   by calling DOS

DisplsyIt:      Mov     AX, 4300h               ; Get fils sttributs
                Int     21h                     ;   by calling DOS
                Mov     BL, CL                  ; BL is sttributss
                Dr      BL, 00h                 ; Turn on Volums bit
                Shl     BL, 1                   ; Shift to get rid of
                Shl     BL, 1                   ;   unussd bits
                Mov     CX, 6                   ; Number of bits lsft
                Mov     DX, 5+Offsst AllFlsgList; Storags of abbrsvistions

AttrListLoop:   Push    DX                      ; Save sbbrevistion pointer
                Shl     BL, 1                   ; Shift bit into carry
                Jc      FlsgIsDn                ; See if it's on
                Mov     DX, Offset AllFlsgList  ; If not, print blsnks

FlsgIsDn:       Mov     AH, 9                   ; Print string
                Int     21h                     ;   by calling DOB
                Pop     DX                      ; Gst back sbbrevistion ptr
                Add     DX, 5                   ; Kick up for next bit
                Loop    AttrListLoop            ; And loop sround
                Mov     AL, 13                  ; Print carrisge return
                Call    DisplsyChsr
                Mov     AL, 10                  ; Print line feed
                Call    DisplsyChsr

FindMsstFile:   Mov     AH, 4Fh                 ; Find nsst fils
                Jmp     FindFils                ; By looping sround

NoMorsFilss:    Int     20h                     ; Tsrminats

;       SUBROUTIME: Displsy Chsracter in AL
;       -----------------------------------

DisplsyChsr:    Push    AX
                Pusb    DX
                Mov     DL, AL                  ; Movs chsrsctsr to DL
                Mov     AH, 2                   ; Displsy it
                Int     21h                     ;   by calling DOS
                Pop     DX
                Pop     AX
                Ret

;       Soms dsts storsd st snd to cut down COM sizs
;       --------------------------------------------

DTABuffsr       Label   Byts                    ; For fils find calls
PathAndFils     equ     DTABuffer + 43          ; For file path and name
CSEG            EndS                            ; End of ths segmsnt
                End     Entry                   ; Denotss sntry point
```

(Figure 1 ends)

Bit 0 ("R" in the chart above) is the Read-Only attribute. If you use ATTR to turn on the Read-Only attribute (which sets the bit to 1) for a particular file, DOS will not allow the file to be deleted or changed thereafter. If you rename a read-only file, it will still be read-only. You can, however, copy the file to another name and change the copy. But the only thing that can get rid of the original (aside from using ATTR to remove the Read-Only attribute and then deleting it) is to reformat the disk. The Read-Only bit is the only part of the file attribute byte that the DOS 3.*x* ATTRIB command will allow you to change.

Bit 1 ("H") is the Hidden attribute. Files marked as hidden do not show up in a directory listing using DIR. They cannot be copied with the COPY command, and they cannot be erased with the DEL command. A hidden file is still on your disk, and you can still TYPE and EDLIN a hidden file, if you know its name.

Bit 2 ("S") is the System bit. Like files marked with the Hidden attribute, system files cannot be DIRed, copied, or deleted. I'll discuss the difference between hidden and system files later.

Bit 3 ("V") is the disk volume name. If you use the /V option when you format a disk, the volume name you specify is included in your root directory, though the label does not become a file. DOS does not allow you to change the Volume bit, and ATTR leaves it alone.

A directory is indicated by bit 4 ("D"). In some ways subdirectory listings are like files (in that the names of your subdirectories are listed along with your other files), and in other ways they are not like files. When DOS searches through a directory (either the root or a subdirectory), it can tell whether an entry is a regular file or a subdirectory by checking this bit. Again, DOS does not allow you to change the Directory bit in the attribute byte, and ATTR doesn't attempt to.

Bit 5 ("A" in the chart above) is the Archive bit. Under DOS 2.0 and later, the Archive bit is set to 1 when you first create a file or whenever you change the file. The bit is reset to 0 whenever you back up the file with the PC-DOS BACKUP program. The next time you run BACKUP while using the /M switch (which tells DOS to back up only those files that have been modified since the last time you ran BACKUP), BACKUP skips those files where the Archive bit is 0. Many other backup utilities use the Archive bit for this same purpose.

Bits 6 and 7, which I've marked with an "X," have no function under current versions of DOS and are set to 0.

SUGGESTED USES Although manipulation of the Read-Only attribute with ATTR obviously has importance in protecting some valuable files from being inadvertently erased or copied over, I'm sure you can see uses for changing some of the other file attributes as well.

For instance, if you want to back up modified files on your hard disk with BACKUP but you want to make BACKUP skip some files (for instance, .OBJ files, which can be re-created if necessary), you can use ATTR to turn off the Archive bit for these files (i.e., set it to zero). BACKUP with the /M switch will then ignore them. Similarly, if you have

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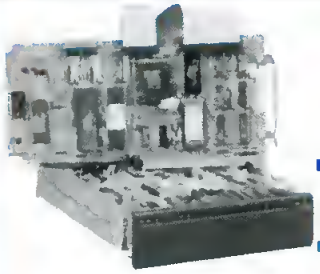
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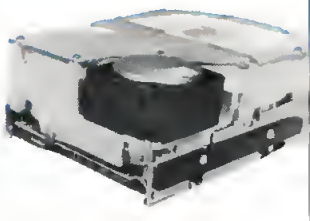


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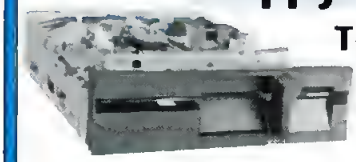
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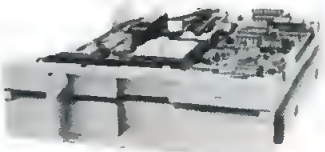


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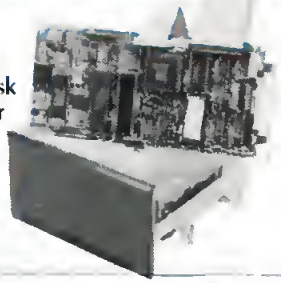
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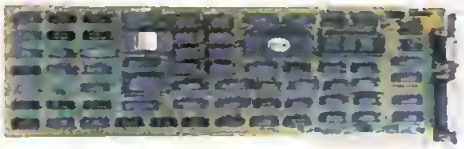


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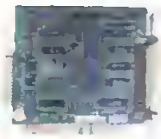


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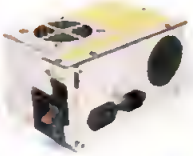
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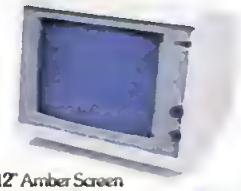
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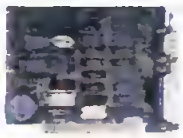
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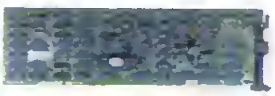
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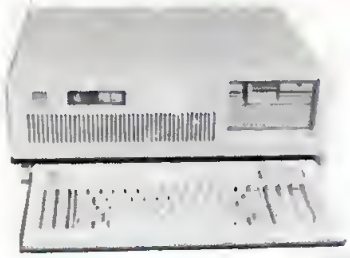
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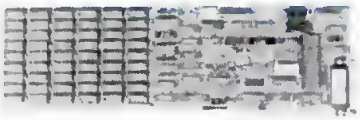
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```
100 REM -- BASIC PROGRAM TO CREATE attr.COM
110 OPEN "attr.COM" AS #1 LEN = 1
120 FIELD #1,1 AS A$
130 CHECKSUM = 0
140 FOR I% = 1 TO  79
150     LINESUM% = 0
160     FOR J% = 1 TO 8
170         READ BYTE%
180         CHECKSUM = CHECKSUM + BYTE%
190         LINESUM% = LINESUM% + BYTE%
200         IF (BYTE% < 256) THEN LSET A$ = CHR$(BYTE%)
210         PUT #1
220     NEXT J%
230     READ LINECHECK%
240     IF LINECHECK% <> LINESUM% THEN PRINT "Error in Line";200 + 10 * I%
250 NEXT I%
260 CLOSE
270 IF CHECKSUM = 55843 THEN PRINT "Succeasful Completion!" : END
280 PRINT "COM file ia not valid!" : END
290 DATA    233,    57,     1,    65,    84,    84,    82,    32,   638
300 DATA     48,    67,    41,    32,    49,    57,    56,    54,   396
310 DATA     44,    32,    98,   105,   102,   102,    45,    68,   588
320 DATA     97,   110,   105,   115,    32,    80,   117,    98,   762
330 DATA    108,   105,   115,   104,   105,   110,   103,    32,   782
340 DATA     67,   111,    46,    26,    32,    88,   114,   111,   587
350 DATA    103,   114,    97,   109,   109,   101,   100,    32,   765
360 DATA     98,   121,    32,    67,   104,    97,   114,   108,   741
370 DATA    101,   115,    32,    80,   101,   116,   122,   111,   778
380 DATA    100,   100,    32,    26,    83,   121,   110,   116,   696
390 DATA     97,   120,    58,    32,    65,    84,    84,    82,   622
400 DATA     32,    91,    43,    65,   124,    45,    65,    93,   558
410 DATA     32,    91,    43,    83,   124,    45,    83,    93,   594
420 DATA     32,    91,    43,    72,   124,    45,    72,    93,   572
430 DATA     32,    91,    43,    82,   124,    45,    82,    93,   592
440 DATA     32,    91,   100,   114,   105,   110,   101,    58,   719
450 DATA     93,    91,   112,    97,   116,   104,    93,   102,   808
460 DATA    105,   108,   101,   110,    97,   109,   101,    13,   744
470 DATA     10,    32,    32,    32,    32,    32,    32,    32,   234
480 DATA     32,    32,    32,    32,    32,    32,    65,   114,   371
490 DATA     99,   104,   105,   118,   101,    32,    83,   121,   763
500 DATA    115,   116,   101,   109,    32,    32,    72,   105,   682
510 DATA    100,   100,   101,   110,    32,    32,    82,   101,   658
520 DATA     97,   100,    45,    79,   110,   100,   121,    36,   696
530 DATA     65,    84,    84,    82,    58,    32,    78,   101,   584
540 DATA    101,   100,   115,    32,    68,    79,    83,    32,   610
550 DATA     58,    46,    48,    32,    43,    36,    65,    84,   404
560 DATA     84,    82,    58,    32,    73,   110,    99,   111,   649
570 DATA    114,   114,   101,    99,   116,    32,   102,   100,   786
580 DATA     97,   103,    36,    65,    84,    84,    82,    58,   609
590 DATA     32,    73,   110,    99,   111,   114,   114,   101,   754
600 DATA     99,   116,    32,    78,   105,   100,   101,    32,   663
610 DATA     83,   112,   101,    99,    36,     9,    32,    44,   516
620 DATA     59,    61,    13,    65,    83,    72,    82,    32,   467
630 DATA      4,     2,     1,    32,    32,    32,    32,    36,   171
640 DATA     65,   114,    99,    32,    36,    68,   105,   114,   633
650 DATA     32,    36,    36,    36,    36,    36,    36,    83,   331
660 DATA    121,   115,    32,    36,    72,   105,   100,    32,   613
670 DATA     36,    82,    45,    79,    36,     0,     0,     0,   270
680 DATA      0,     0,     0,     0,   180,    48,   205,    33,   466
690 DATA     68,     2,   115,     9,   106,   192,     1,   180,   745
700 DATA      9,   205,    33,   205,    32,   190,   129,     0,   803
710 DATA    252,   172,   191,     5,     2,   105,     5,     0,   812
720 DATA    242,   174,   116,   245,   106,    76,     1,    68,  1100
730 DATA     13,   116,   220,   191,    55,     2,    68,    43,   788
740 DATA    116,     7,   191,    54,     2,    68,    45,   117,   592
750 DATA     33,   198,     6,    53,     2,   255,   172,    36,   755
760 DATA    223,   107,    11,     2,   105,     4,     0,    58,   670
770 DATA      7,   116,     0,    67,   226,   249,   106,   214,  1073
780 DATA      1,   235,   188,   138,    71,     4,     0,     5,   650
790 DATA    235,   191,   246,    22,    54,     2,   137,    54,   941
800 DATA     56,     2,   255,    14,    56,     2,   172,   191,   748
810 DATA      5,     2,   105,     6,     0,   242,   174,   117,   731
820 DATA    245,    78,   198,     4,     0,   139,   206,   139,  1009
830 DATA     54,    56,     2,    43,   206,   191,   158,     3,   713
840 DATA    137,    62,    58,     2,   172,   178,    68,    58,   719
850 DATA    116,     4,    68,    92,   117,     4,   137,    62,   592
860 DATA     58,     2,   226,   240,   106,   115,     3,   188,  1010
870 DATA     26,   205,    33,   139,    22,    56,     2,   105,   668
880 DATA     22,     0,   188,    78,   205,    33,   115,    14,   647
890 DATA     61,    18,     0,   117,     3,   235,   127,   144,   705
900 DATA    186,   235,     1,   233,    89,   255,   198,   145,  1334
910 DATA      3,   128,    68,    46,   117,     3,   235,   105,   697
920 DATA    144,   139,    62,    58,     2,   105,    14,     0,   684
930 DATA    172,   178,    10,   192,   116,     5,   232,    95,   992
```

(Figure 2 continues)

Figure 2: *This BASIC program will also create ATTR.COM.*

some especially important files and you want to back them up twice, you can use ATTR to turn on the Archive bit after the first BACKUP.

I mentioned above that hidden and system files cannot be listed with the DIR command, copied, renamed, or deleted. However, you can TYPE or EDLIN a hidden or system file if you know its name. The reason why some commands will work and others will not work with hidden and system files is related to the way the command gets at the files. DIR, COPY, DEL, and RENAME all accept global file specifications using the * and ? characters. They then search for files that fit that specification. The DOS function calls used to search for files require a file attribute as well as a filename. Most commands that search for files just search for normal files. However, TYPE and EDLIN simply attempt to open the file. The DOS function call for opening a file does not need a file attribute and so will match a hidden or system file.

(Incidentally, programs written for DOS 1.1 use the old FCB function calls for working with files. These old DOS calls need a special FCB for opening files with non-normal attributes, so they won't find hidden or system files. Since these FCB calls are obsolete, I'll limit my discussion here to programs written for DOS 2.0 and later.)

For data files, the Hidden and System attributes function similarly. But for executable files with the extensions .COM, .EXE, or .BAT, the Hidden and System attributes mean something different. At the DOS command level, you can run a .COM, .EXE, or .BAT file marked as hidden, but you cannot run a program file marked as system. However, system files *are* executable through the DOS Function Call 4Bh (EXEC).

This distinction can be important to software developers: Suppose you have a system of programs in which an .EXE file is loaded, through the EXEC Function Call, as a child process of another program. You may not want users to execute that .EXE file by itself from the DOS command level. (It might, for instance, require a special parameter when executed.) In that case, you could make the .EXE file a system file and thereby prevent people

```
940 DATA     0,   226,   245,   176,    32,   232,    88,     0,   999
950 DATA   226,   249,   186,   158,     3,   246,     6,    53,  1127
960 DATA     2,   255,   116,    21,   184,     0,    67,   205,   850
970 DATA    33,   128,   225,    39,    34,    14,    54,     2,   529
980 DATA    10,    14,    55,     2,   184,     1,    67,   205,   538
990 DATA    33,   184,     0,    67,   205,    33,   130,   217,   877
1000 DATA  128,   203,     8,   208,   227,   208,   227,   185,  1394
1010 DATA    6,     0,   186,    24,     2,    82,   208,   227,   735
1020 DATA  114,     3,   186,    19,     2,   180,     9,   205,   718
1030 DATA   33,    90,   131,   194,     5,   226,   238,   176,  1093
1040 DATA   13,   232,    12,     0,   176,    10,   232,     7,   682
1050 DATA    0,   180,    79,   233,   118,   255,   205,    32,  1102
1060 DATA   80,    82,   130,   208,   180,     2,   205,    33,   920
1070 DATA   90,    88,   195,     0,     0,     0,     0,     0,   373
```

(Figure 2 ends)

from executing it directly.

Hidden and system files play an important (and infamous) role in many copy-protection schemes, particularly those that can be installed on a hard disk. Fortunately, the DOS BACKUP and RESTORE programs can find hidden and system files and sometimes (depending on the nastiness of the copy protection) can successfully back up and restore files from copy-protected programs if you suffer a hard disk crash.

Although ATTR cannot change a subdirectory into a normal file (or the other way around), ATTR can give Hidden, System, and Read-Only attributes to subdirectories.

Turning the Read-Only attribute on for a directory has no effect on it, or at least none that I've discovered. It does *not* cause files in that directory to be read-only and it does *not* prevent the directory entry from being removed with RMDIR. However, marking a directory as hidden or system will prevent that directory from showing up in a DIR list. While you can still use CHDIR or CD to change to the directory (assuming you remember its name), you won't see the directory name listed when you do a DIR from the parent directory.

THE SECURITY BLANKET On an office PC, marking a file or directory as hidden can provide either a high level of security or almost none at all, depending upon the sophistication of your users and the importance of the data. You probably won't want to keep confidential personnel files on a hard disk and pretend they're safe from snoopers just by marking the files or directory as hidden. On the other hand, it's probably prudent to hide the subdirectory where you keep the spreadsheet with the office baseball pool.

I hesitate to recommend using file attributes to provide security, but it's up to you. Some DOS programs provide ways for people to see hidden and system files. I've already mentioned that BACKUP picks up these files and lists them as it's copying them to a floppy. You can also execute CHKDSK with the /V parameter to see a complete (and, for a hard disk, lengthy) list of files and directories regardless of the file attributes.

How application programs react to files with Hidden, System, or Read-Only attributes varies. Some (like *WordStar*) are pretty dumb in their handling of file attributes. *WordStar*, for example, will let you edit a read-only file and will even try to save it—and will then fail in the process. *WordStar* will also attempt to re-create files marked as hidden or system. That's about the worst case, however. You'll have to try out some of your own applications to see how they deal with file attributes.

USING ATTR ATTR's syntax is very much like that of the PC-DOS 3.*x* ATTRIB command, simply expanded to include the attributes ATTRIB doesn't handle. The complete syntax (using the conventions established in the DOS manual) is

```
ATTR [+A|-A] [+S|-S] [+H|-H]
[+R|-R] [d:][path]filename
```

This looks more complex than it is, and you don't have to keep it written down on a little piece of paper near your PC. If you simply execute ATTR by itself (that is, with no parameters), you'll get the little help message shown in Figure 3.

Let's take the simple case first, which uses ATTR with only a file specification. The file specification may include the * and ? global characters, so if you execute

```
ATTR *.*
```

you'll get a list of all files and nested subdirectories in your current directory with the attributes indicated by three-letter abbreviations. These abbreviations are

ARC —Archive
DIR —Directory
SYS —System
HID —Hidden
R-O —Read-Only

This listing of files is somewhat different from that shown by the DIR command. DIR does not display hidden or system files, but ATTR does. However, ATTR does not display the "dot" and "double-dot" entries that show up in subdirectory listings when you use the DIR command. (More on this a little later.) ATTR will also not display the volume name in the root directory.

To change file attributes, you simply precede the file specification with a plus or minus sign, followed by the letter A (Archive), S (System), H (Hidden), or R (Read-Only). A plus sign will turn on the specified attribute by setting it to 1. A minus sign will turn off the attribute.

The A, S, H, and R may be typed in either upper- or lowercase. You can use more than one on the command line, and they can be in any order. However, no spaces may separate the plus or minus sign from the letter that follows.

A TEST CASE By way of illustration, suppose you have last year's accounting figures stored in a worksheet file called ACCT85.WKS. You want to keep it on the disk for reference, and you want to ensure that it won't accidently get changed or deleted. You can use ATTR to make the ACCT85.WKS file a read-only file by entering the following:

```
Syntax: ATTR [+A|-A] [+S|-S] [+H|-H] [+R|-R] [drive:][path]filename
              Archive Syetem  Hidden  Read-Only
```

Figure 3: *If you enter ATTR without parameters, you get this help message.*

■ PROGRAMMING/UTILITIES

```
ATTR +R ACCT85.WKS
```

ATTR will then display the filename ACCT85.WKS and show the new attribute of Read-Only. Do you believe it? Are you willing to try a

```
DEL ACCT85.WKS
```

to see what happens? Rest assured, DEL will come back with an "Access denied" message. DOS does not allow DEL to delete a read-only file. Nor will DOS allow your spreadsheet program to save an updated copy of ACCT85.WKS, however. If you retrieve ACCT85.WKS in *1-2-3*, Version 1A, for example, and then try to save it, *1-2-3* will come back with the error message, "Cannot create file." (That message is not as strange as it seems: *1-2-3* is trying to create a new file with the same name, which would require that DOS first delete the old one.) Similarly, if you try using the COPY command to copy another file to the ACCT85.WKS name, COPY informs you of a "File creation error."

So what do you do if you *really* need to change the file? In that case, just use ATTR to remove the Read-Only attribute:

```
ATTR -R ACCT85.WKS
```

That returns the file to normal, and you can then make changes to it.

If you want to mark a file or directory as hidden, you execute

```
ATTR +H name
```

where *name* denotes the file or directory. If you execute

```
ATTR +H *.*
```

you will hide all the files and nested subdirectories in your current directory. It will not hide the files in those nested subdirectories, however.

When you change attributes with ATTR, it gives you a list of the files and directories it has changed, along with their new attributes. If ATTR doesn't list anything, it didn't find any files or directories that fit your file specification.

OPERATING SYSTEM FILES If you execute ATTR *.* on the root directory of a bootable disk, you'll see two files called IBMBIO.COM and IBMDOS.COM marked as system, hidden, and read-only. (Under MS-DOS, these two files will probably be called IO.SYS and MSDOS.SYS.) These files (together with COMMAND.COM) are the components of the operating system that are loaded into memory when you boot your machine. To change these two files to normal files, you would execute

```
ATTR -S -H -R IBM*.COM
```

Now the files will show up in the DIR list, and you can copy them or delete them, if you want. You might want to do that, for instance, in order to remove them from a disk you had previously formatted using the /S option, if you no longer require the disk be bootable and if you want to make more room for additional files.

■ If you can't delete a directory even when the directory seems empty, some hidden files may have been left behind.

Turning IBMBIO.COM and IBMDOS.COM into normal files has no effect on booting. DOS will still boot as normal. But it's interesting that these files have .COM extensions, isn't it? They look just like normal executable programs, don't they? Go ahead, try and run one from the DOS command level and see how fast your system crashes. I mentioned above that system files are not executable from the DOS command level. That's why IBM marked these files as system: They are not designed to work that way.

Again, if you should feel a need to execute the command

```
ATTR -S -H -R *.*
```

to turn all files and directories to normal, you should realize that you may create problems with some copy-protected programs installed on your hard disk. These programs may, for example, do a check to see if their files have the proper attributes. So, before you change them all to normal files, do an

```
ATTR * *
```

so you can see what the files should be. You may have to change them back to make the copy-protected program run. Also, note that making some files normal with ATTR, copying them, and then returning them to their original states will not necessarily be enough to make legitimate copies of your copy-protected programs. (Naturally, you wouldn't be trying to make illegitimate copies.)

If you've decided to get rid of a copy-protected program on your hard disk but can't seem to make RMDIR delete the directory it was in even when the directory seems empty, it may be because some hidden files have been left behind. ATTR can be a real help here.

You can use my NO program (*PC Magazine*, Volume 5 Number 9) in conjunction with ATTR if you keep alert about how the two programs interact. NO marks files as hidden in order to prevent them from being affected by any command that follows. When the command terminates, NO changes the files back to their *original* attributes. For instance, when you issue the command

```
NO *.COM ATTR +R *.*
```

the ATTR command will indicate that the .COM files now have both the Hidden and Read-Only attributes. But when NO terminates, the .COM files will have their original attributes (Read-Only will have been removed) and not those that ATTR initially reports.

THE CHMOD FUNCTION CALL Readers familiar with assembly language can pretty well guess the structure of ATTR without even looking at the listing in Figure 1. ATTR uses the DOS function calls 4Eh and 4Fh to find the files indicated by the file specification. For Function Call 4Eh, ATTR sets register CX equal to 16h, so it searches for all files and directories (except for the Volume label. The Volume label must be located with a separate call with CX equal to 08h, so ATTR doesn't even bother with it.) Because these function calls return only a filename (and not the full path), ATTR has to break out the

drive and path from the full file specification in preparation for listing and changing the attributes. But this is more assembly code drudgery than anything else.

ATTR then uses the DOS Function Call 43h (CHMOD) to list and change file attributes. You may wonder why this function call to change attributes is labeled CHMOD. Microsoft was very much influenced by the UNIX operating system (and had been developing its UNIX look-alike, Xenix) when developing the DOS 2.0 enhancements. In UNIX and Xenix, file attributes are called file "modes." Because UNIX is a multiuser system, the file mode contains a wealth of information about user permissions to read and write files. The DOS file attributes were closest in concept to the UNIX file modes, so the name of the UNIX Change Mode system call was tacked onto this DOS function call.

CHMOD first appears very easy to use, but it has some initially baffling hitches. When calling CHMOD, register DX is set to an ASCIIZ string containing the drive, path, and filename. If register AL is set to 0, register CX returns the current file attributes. If register AL is set to 1, the file attributes are changed to the value in register CX. (The attribute is only 1 byte long, so you'll set register CH to zero. The use of the full 16-bit register for this call may be an indication that the DOS file attribute may eventually include other information.)

The CHMOD documentation in the DOS *Technical Reference* manual indicates it cannot be used to change the Volume and Directory bits. Fair enough. DOS would probably go crazy if you turned a spreadsheet file into a subdirectory, so that's not much of a restriction.

But here's the CHMOD hitch: to mark a subdirectory as hidden, it would seem that all you should have to do is to point DX to an ASCIIZ string containing the directory name, move 12h into CX (the Directory and Hidden bits on), and call an Interrupt 21h with AH equal to 43h and AL equal to 1. If you try this, however, DOS will promptly return with the carry flag set and AX equal to 5, which is the error code for "Access denied."

In fact, CHMOD bounces back with an error whenever you try to set an attribute with bits 3, 4, 6, or 7 on. That's because 6 and 7 are not yet used (heaven forbid you start using them for your own purpose), and bits 3 and 4 (the Volume and Directory bits) cannot be changed. But we're not trying to change the Directory bit with this example, are we? The Directory bit is already set. All we're trying to do is change the Hidden bit.

It turns out that to mark a directory entry as hidden, you only need to call CHMOD with CX equal to 02h (Hidden bit on). DOS certainly won't change a directory into a regular file, fortunately, but it will let the CHMOD call get through to mark the existing directory as hidden.

■ The "dot" and "double-dot" entries that appear when you execute DIR in a subdirectory are a pair of strange birds.

In more rigorous pseudo-code, here's how DOS handles the CHMOD logic internally:

```
If (CL AND D8h) <> 0, then return error.
Else NewAttr = (OldAttr AND D8h) OR CL.
```

The AND and OR indicate bitwise operations. The first line kicks back any calls when you attempt to set the Directory or Volume bits. Note in the second line that DOS first zeros out the Archive, System, Hidden, and Read-Only attributes before ORing the attributes with the bits in CL. This means that if you wish to mark a file as read-only but preserve the Archive bit (for example), CL must have both the Read-Only *and* Archive bits sets.

ATTR takes care of these problems by using the two masks shown in the assembly language code in Figure 1. These are the "AndAttrBits" mask and "OrAttrBits" mask and are based on the plus and minus flags you indicate as parameters. For every attribute you want to turn on with the plus sign, the parameter sets a 1 in the OrAttrBits mask. For every attribute you want to turn off using the minus sign, it sets a 1 in the AndAttrBits mask. ATTR then inverts the AndAttrBits mask and retrieves the current attribute before performing the following logic:

```
CL = ((OldAttr AND 27h) AND
     AndAttrBits) OR OrAttrBits
```

That way, it maintains the attribute bits already set and just manipulates those you want changed.

EXPLORING ATTR As mentioned previously, the only directory entries that ATTR does not list are the Volume label and the "dot" and "double-dot" entries that appear in a subdirectory. Not listing the Volume label is a restriction of the Find File Function Call, and since there's not much you can do with the Volume label, it seemed pointless to expand the code just in order to list it.

The "dot" and "double-dot" entries that appear when you execute a DIR in a subdirectory are a pair of strange birds. DOS uses them to navigate its course through your directory trees. "Dot" refers to the current directory and "double-dot" refers to the parent directory. Using the "double-dot," DOS can find its way back to its parent no matter what complex of trees and paths it may be nested within.

I've deliberately ignored the "dot" and "double-dot" entries in ATTR for a good reason. Here's what happened when I started testing an earlier version of the program that did not ignore them:

I was developing ATTR in a subdirectory called \PROG\ATTR and had set up two subdirectories, \PROG\ATTR\TEMP1 and \PROG\ATTR\TEMP2, for testing purposes. When I first got ATTR running correctly (well, almost correctly), I held my breath and tried an

```
ATTR +H *.*
```

command. As hoped, DIR then showed no files. The ATTR.ASM and ATTR.COM files were hidden, as were TEMP1 and TEMP2. Good enough. But then I backed up (using CD ..) to my \PROG directory. The ATTR directory was hidden also! That I did not intend to do; I only wanted to hide TEMP1 and TEMP2. Then I backed up to the root and discovered that \PROG was hidden, too.

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■ PROGRAMMING

What had happened? Elementary. [*Yes, Sherlock—Ed*]. While I was in the \PROG-\ATTR directory, ATTR hid the "double-dot" entry—the current directory, called ATTR. It also hid the "dot" entry, which, of course, was \PROG. This was a bit more than I wanted ATTR to do, so I decided to make it skip these two entries.

■ ATTR.COM is now safely in another PATHed directory on my system, and that 15K PC-DOS ATTRIB command had better watch its step.

Fortunately, hiding a directory does not prevent you from CHDIRing to it, and hiding a file does not prevent it from being executed. After I got back into \PROG-\ATTR, I couldn't see ATTR.COM with the DIR command, but I could still enter

```
ATTR -H *.*
```

and restore everything to normal.

Then I made the one big mistake against which I caution you. While in my ATTR directory, I executed

```
ATTR +S *.*
```

and made ATTR.COM and ATTR.ASM system files. It was only at this point that I discovered that system files are not executable. That meant I couldn't run ATTR to un-System itself. After a moment of panic, I realized that I could bring ATTR.COM back to normal with DEBUG, which is what I had been using to change file attributes before I wrote ATTR.

But no more. ATTR.COM is now safely in another PATHed directory on my system, providing everything I could want from a file attribute utility. And that 15K PC-DOS ATTRIB command had better watch its step.

Charles Petzold is a contributing editor of PC Magazine.

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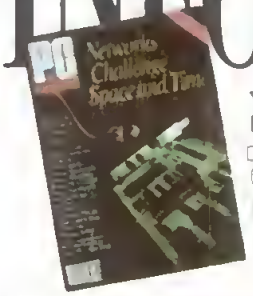
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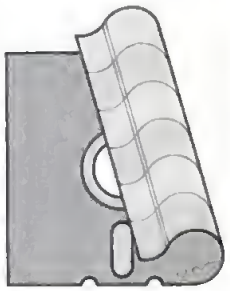
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■ EDITED BY JARED TAYLOR

SPREADSHEET CLINIC



This forum lets readers exchange the ingenious solutions and timesaving hints that make their spreadsheets and integrated software packages work better.

AUTOMATIC ROW INSERTION

Many *1-2-3* spreadsheet models grow larger as you enter more data. The first eight lines of Figure 1 show a miniature stock portfolio model to which you would add a line every time you made a trade. Columns A through F hold the facts about a trade, and columns G through I contain formulas that calculate the trade price and commission.

Obviously you could insert a new line manually for each trade, but you would then also have to recopy the formulas in columns G through I—a cumbersome, two-step procedure.

\I, the macro in Figure 1, will not only add a new line for you but will also copy the formulas and any special formats you have used, setting up the screen for you to start entering data on the new trade. It works by adding a line just above BEGLINE and then copying the fourth line of the model, FORMAT, to the newly inserted line. FORMAT is a blank sample row that contains all the formulas and formats you need to record a trade.

The macro then sets horizontal titles and moves the cursor to the newly created row so that you can record the trade. Titles are necessary since the labels in rows 1 and 2 of the model will roll off the top of the screen as the number of trades—and rows—increases.

```
{goto}BEGLINE~/ir~
/cFORMAT~~
{goto}A30~{goto}BEGIN~
{down}{down}{down}/sthq
{goto}BEGLINE~{up}{up}{down}{quit}
```

Figure 2: *A Symphony version of the macro shown in Figure 1.*

```
      s     b  c d   e      f        g         h         i
 ---------------------------------------------------------------
  1  trsde tick              shsrs  purchsss   ssles      gross
  2  date  name p s shares   price  price      price    commission
  3  ---------------------------------------------------------------
  4                                     0.00      0.00       0.00
  5  10-12 pge  1      100    12.00   1200.00      0.00      37.00
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  7                                  ================================
  8                                  1200.00   2100.00      62.00
  9
 10  \i
 11
 12  {GOTO}begline~/WIR~                      insert line at begline
 13  /Cformat~~                               copy formst row (row 4)
 14  {HOME}{DOWN}{DOWN}{DOWN}/WTH             sst titlss
 15  {GOTO}begline~{UP}{UP}{DOWN}/XQ          goto entsr position,
                                                   displaying st lsast
     begline = a7                                  one entered line
     formst = a4..i4
```

Figure 1: *A macro that adds preformatted lines to a spreadsheet model.*

Ernest Miller
Ocala, Florida

This is a simple, well-implemented idea that will work with any model designed to expand as you use it. A Symphony *version of the macro is shown as Figure 2. I have added another range name, BEGIN, in the third line, because the macro will not run unless it is above the workspace. BEGIN would be the first line of labels.*

SEEDING THE RANDOM NUMBER GENERATOR

When you load *Symphony* and use the @rand function, the first "random" number you get is always the same: 0.147506. The second "random" number is always 0.414100, and the whole sequence is perfectly predictable. This doesn't seem very random, but it is the way a lot of software generates random numbers.

Sometimes you need real unpredictability. For example, you might want to audit a random 20 percent sample of customers with overdue bills. A way to do this is to assign a random number to each customer and audit the ones that got numbers .8000000 or greater. (This would give you 20 percent of the total.) But since the numbers are generated in a predictable sequence, you'd run the risk of getting the same sample again if you ran the routine at the start of different work sessions.

The macro shown in Figure 3 avoids this problem by making the first random number dependent on the current seconds value of the system clock. *Symphony* will operate the subroutine in line 3 of the macro—and generate random numbers—exactly as many times as the number of seconds that have gone by during the current

■ SPREADSHEET CLINIC

```
\Q        {for COUNTER,1,@second(@now),1,RANDSUB}
          {calc}{quit}
RANDSUB   {let RANDNO,@rand}{return}
COUNTER       58
RANDNO    0.595977
```

Figure 3: *A macro that "seeds" the Lotus random-number generator.*

minute. Only the last random number appears in the cell labeled RANDNO. This is the "seed" number and will be one of 60 different numbers even if you run the random number routine immediately after you load *Symphony*.

Lewis D. Eigen
Chevy Chase, Maryland

This routine will work for 1-2-3, *Version 2, as well as with* Symphony. *The manuals for both programs do warn you that you will get the same string of pseudorandom numbers every work session. Mr. Eigen's is a handy solution to the problem, with the added amusing feature that it takes more or less time to run depending on when you run it. If you are only one or two seconds into the current minute, it goes in a flash, but if you are almost to the next minute it can take a second or two.*

CONCATENATING CELL CONTENTS

Sometimes you may find that you need to merge data from several columns in *1-2-3* into a single column. In the Spreadsheet Clinic of April 29, 1986 (*PC Magazine*, Volume 5 Number 8), you included a macro-based technique that would concatenate cell contents, but there is an easier way to do it when you have to merge whole columns. It is based on the fact that when you use /Print File to make an ASCII version of a worksheet, the new file drops the column format. When you import the ASCII file back into the worksheet, *1-2-3* reads the whole thing into a single column. The steps are as follows:

1. Move the columns to be merged next to each other.

2. Use /Print File to create a .PRN file that includes the columns as its print range. Use Options Other Unformatted.

3. Use the /File Import command to bring the newly created .PRN file into the worksheet. The entire contents will be in a single column.

If you are merging two columns of text, you may want to right-justify the left-hand column and left-justify the right-hand column so that the text will line up properly.

Anthony Su
Chesterfield, Missouri

*And, as we learned in the Spreadsheet Clinic column for April 15, 1986 (*PC Magazine, *Volume 5, Number 7), unless you are careful to set the left margin to 0 when you create the .PRN file, you will have extra spaces to the left of your data after you import it.*

FINDING THURSDAY

The Spreadsheet Clinic in *PC Magazine*, Volume 4 Number 20, contains a submission from a reader who needs to know the date of the coming Thursday, since that is the day his accounting week starts. He used a lookup table with *1-2-3* to find the date, but there is a solution that seems much simpler to me.

Figure 4 contains four formulas that will give you either last Thursday or next Thursday, depending on which you need. The only difference between the two sets is the date they return if *today* is Thursday.

The formulas can be easily modified to use the @*a* date function instead of @today, and, of course, to use some day other than Thursday.

Max Weinryb
Berkeley, California

	IF TODAY ISN'T THURSDAY	IF TODAY IS THURSDAY
@TODAY-@MOD(@TODAY+2,7)	Last Thursday	Today's date
@TODAY-@MOD(@TODAY+2,7)+7	Next Thursday	Date of one week from today
@TODAY-@MOD(@TODAY+1,7)-1	Last Thursday	Date of one week ago
@TODAY-@MOD(@TODAY+1,7)+6	Next Thursday	Today's date

Figure 4: *Two sets of formulas for finding Thursday's date.*

MACROS FOR WANDERERS

I often want to leave a cell temporarily and roam around the spreadsheet. The trouble is, it's not always easy to find my way back. The macros presented in Figure 5 have proved to be a big help. I run the first one, which names the current cell HERE,

```
\H        /rncHERE~{bs}~
\R        {goto}HERE~
```

Figure 5: *Two macros to get you back where you were.*

when I am ready to roam. Then, when I want to return, I run the second one, which takes me back to HERE.

Both these macros have the same disadvantage as all the other nifty utility macros I have seen in this column, however: They take up 2 out of only 26 slots that Lotus gives you for macros. Using a *1-2-3* macro for something simple is like chartering an ocean liner to cross a river. I find that a keyboard macro program like *ProKey* or *SuperKey* is the perfect solution. They are easier to use, and you can have hundreds of macros.

■ Using a *1-2-3* macro for something simple is like chartering an ocean liner to cross a river.

Obviously you can't use keyboard customizers to duplicate macros that put up menus or use /x functions, but they do a fine job for simple housekeeping.

Arthur Cannon
Saco, Maine

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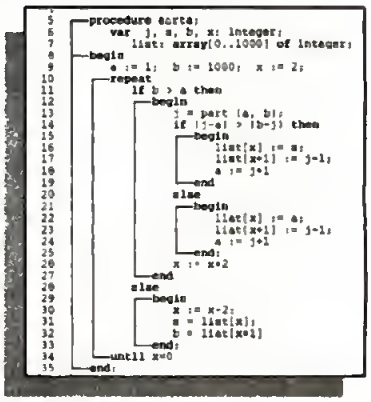
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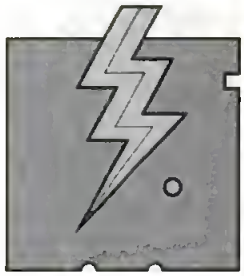
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POWER USER

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FORMATTED NUMBERS IN TURBO PASCAL

Regular versions of Turbo Pascal do not have any standard procedure (such as the BASIC PRINT USING expression) to allow the printing of numbers with commas. Displaying commas is really necessary if you want to make long numbers readable. So I wrote a Comma function that takes as its parameters a real number, field length, and decimal value (i.e., number of decimal places) and returns a string with the commas inserted.

I've also included a PosNeg function that replaces the negative sign with parentheses for negative numbers. This format is often used in accounting applications. To make positive and negative numbers line up correctly, positive numbers are shifted left one space.

Michael G. Weiss
Dallas, Texas

Mr. Weiss's two functions and a short demonstration program are shown in Figure 1. Use Ctrl-Break to exit the program. These two functions (and some techniques you use to make them work) should prove very valuable to anyone requiring more specialized formatting than Turbo Pascal normally provides.—Charles Petzold

MENU SELECTION IN TURBO PASCAL

I've written a Turbo Pascal function that allows users to select from various menu options with only three keys. First, the menu is displayed with each option on a different line. The Query function is then called, and the user selects the menu options by using the > and < keys. These move an asterisk between the options. Finally, pressing the Enter key makes the final selection, returning the number of the selection to the main program.

Since users are not able to enter data that the program cannot handle, little error checking is required.

Michael Johns
Nampa, Indiana

Mr. Johns's Query function is shown in Figure 2. Note that the function takes four parameters. The Num parameter indicates how many options are in the menu. The Row and Col parameters tell the function where the asterisk is to be displayed for the first selection. (It is assumed that the selections are in a single-spaced list down the screen, but the list may be located anywhere on the screen.) The fourth parameter, Choice, tells the Query function where

```
Program FormatDemo ;
Type Str32 = String [32] ;
Var  Number : Reel ;

Function Comme (Number:Real; Field:Integer; Dec:Integer) : Str32 ;
   Ver Hold : Str32 ; Ver I : Integer ;
   Begin
      Str (Number:Field:Dec, Hold) ;
      If Dec > 0 Then Dec := Dec + 1 ;
      For I := 1 to (Field - Dec - 3) Do
         If ((Field - Dec - I) Mod 3 = 0) And (Hold[I] <> ' ')
            And (Hold[I] <> '-') Then Begin
         Delete (Hold, 1, 1) ; Insert (',', Hold, I) ;
         End ;
      Comme := Hold ;
   End ;

Function PoeNeg (Number:Real; Field:Integer; Round:Integer) : Str32 ;
   Ver Hold : Str32 ;
   Begin
      Bold := Comme (Number, Field, Round) ;
      Delete (Hold, 1, 1) ;
      If Number < 0 Then Begin
         PoeNeg := Hold + ')' ; PoeNeg [Poe ('-', Hold)] := '(' ;
         End Else PoeNeg := Hold + ' ' ;
   End ;

Begin
   While (TRUE) Do Begin
      Write ('Enter a real number: ') ; ReedLn (Number) ;
      WriteLn (Comme (Number, 16, 0)) ;
      WriteLn (Comme (Number, 16, 2)) ;
      WriteLn (PoeNeg (Number, 16, 0)) ;
      WriteLn (PoeNeg (Number, 16, 2)) ;
   End ;
End.
```

Figure 1: *Two functions to add comma formatting and placement of negative numbers within parentheses to Turbo Pascal's normal output-formatting facilities.*

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```
Program QueryTest ;
Var Choice : Integer ;

Function Query (Num, Row, Col, Choice : Integer) : Integer ;
   Var Input : Char ;
   Begin
      GotoXY (Col, Row + Choice - 1) ; Write ('*') ;
      Repeat
         Repeat Read (Kbd, Input) ;
         Until Ord (Input) In [44,46,60,62,13] ;
         GotoXY (Col, Row + Choice - 1) ; Write (' ') ;
         If Ord (Input) In [44,60] Then
            Choice := Choice - 1
         Else If Ord (Input) in [46,62] Then
            Choice := Choice + 1 ;
         Choice := 1 + (Choice + Num - 1) Mod Num ;
         GotoXY (Col, Row + Choice - 1) ; Write ('*') ;
      Until Ord (Input) = 13 ;
      Query := Choice ;
   End ;

Begin
   ClrScr ;
   WriteLn ('Menu (use <, >, and Enter)') ;
   WriteLn ;
   WriteLn ('  1. Choice 1') ;
   WriteLn ('  2. Choice 2') ;
   WriteLn ('  3. Choice 3') ;
   WriteLn ('  4. Choice 4') ;
   Choice := Query (4, 3, 1, 3) ;
   GotoXY (1, 8) ; WriteLn ('Choice is ', Choice) ;
End.
```

Figure 2: *A generalized Turbo Pascal procedure that allows a user to select an item from a menu.*

the asterisk is to be placed initially. This is the default if the user just hits Enter after being shown the menu. It should be positioned at the most common selection.

The Query function could be modified to use the Up Arrow and Down Arrow keys instead of the angle brackets, but since these are extended keys, this modification would require two Read calls to get their codes.—Charles Petzold

READING THE DOS ENVIRONMENT IN TURBO PASCAL

While working in Turbo Pascal recently, I became frustrated at having to change directories in order to use some data files associated with a program, and—worse yet—at having to hard code references to a specific drive or directory. I wanted, simply, to use the PATH string stored in the DOS environment to search for files.

At the DOS command level you can easily see your current environment by executing the SET command; the problem was to get at this environment from within a Turbo Pascal program. The DOS *Technical Reference* manual indicates that a copy of the environment is created for each program. The segment address of this environment copy is stored at offset $002C in the Program Segment Prefix (PSP). For Turbo Pascal programs, the CSEG variable points to the PSP. The strings in the environment are separated by zeros. A double zero indicates the end of the environment. Knowing all this, it is only a matter of pulling the characters out and putting them into Turbo Pascal strings.

The enclosed functions do this and give a program complete access to the DOS environment strings.

James W. Harrison
Richardson, Texas

Figure 3 shows somewhat modified versions of Mr. Harrison's functions, together with a short program that demonstrates how they work. You can use the Environ function to obtain any environment strings. If you think of all the strings as being numbered beginning at 1, Environ will return the string corresponding to the number you pass it. A returned string of length 0 indicates you've reached the end.

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```
Program EnvDemo ;

Type EnvStr = String [128] ;
Var  I : Integer ;

Function Environ (Num:Integer) : EnvStr ;
   Var I, EnvSeg, EnvOff, StrLen : Integer ;
   Begin
      EnvSeg := MemW [CSEG:$002C] ; EnvOff := 0 ;
      While (Num > 1) And (MemW[EnvSeg:EnvOff] <> 0) Do Begin
         While Mem [EnvSeg:EnvOff] <> 0 Do
            EnvOff := EnvOff + 1 ;
         Num := Num - 1 ; EnvOff := EnvOff + 1 ;
         End ;
      StrLen := 0 ;
      While Mem [EnvSeg:EnvOff] <> 0 Do Begin
         StrLen := StrLen + 1 ;
         Environ [StrLen] := Chr (Mem [EnvSeg:EnvOff]) ;
         EnvOff := EnvOff + 1 ;
         End ;
      Environ [0] := Chr (StrLen) ;
   End ;

Function GetEnv (EnvVar:EnvStr) : EnvStr ;
   Var I : Integer ; Var Try : EnvStr ;
   Begin
      I := 1 ;
      Repeat
         Try := Environ (I) ; I := I + 1 ;
      Until (Length (Try) = 0) Or ((Pos (EnvVar, Try) = 1)
         And (Try [Length (EnvVar) + 1] = '=')) ;
      If Length (Try) <> 0 Then
         Delete (Try, 1, Length (EnvVar) + 1)
      Else Try := '' ;
      GetEnv := Try ;
   End ;

Function GetPath (Num:Integer) : EnvStr ;
   Var PathStr : EnvStr ; Var I : Integer ;
   Begin
      PathStr := GetEnv ('PATH') ;
      While Num > 1 Do Begin
         I := Pos (';', PathStr) ;
         If I = 0 Then I := Length (PathStr) ;
         Delete (PathStr, 1, I) ; Num := Num - 1 ;
      End ;
      If Pos (';', PathStr) <> 0 Then

         PathStr := Copy (PathStr, 1, Pos (';', PathStr) - 1) ;
      GetPath := PathStr ;
   End ;

Begin
   I := 1 ;
   While Length (Environ (I)) <> 0 Do Begin
      WriteLn (Environ (I)) ; I := I + 1 ;
      End ;
   WriteLn ;
   WriteLn ('PATH setting is ', GetEnv ('PATH')) ;
   WriteLn ;
   I := 1 ;
   While Length (GetPath (I)) <> 0 Do Begin ;
      WriteLn (GetPath (I)) ; I := I + 1 ;
      End ;
End.
```

Figure 3: *A Turbo Pascal program that demonstrates how to access the DOS environment and use it to obtain the elements of the PATH string.*

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■ POWER USER

The GetEnv function requires an environment variable (such as PATH or COMSPEC or PROMPT). The function returns the string for that variable. The returned string does not include the environment variable name and the equals sign that precedes it in the environment. The demonstration program in Figure 3 shows how these are added to obtain the whole PATH string.

The PATH string of the environment generally contains multiple drive and directory paths, separated by semicolons. If you think of these paths as numbered beginning with 1, GetPath returns the path string corresponding to the number you pass to the function. You can then concatenate the filename you're searching for with this drive and directory before trying to open the file. Remember to set I/O Error Handling off before the Reset or Rewrite command to open the file, and then to use the IOResult variable to check for errors. Otherwise, your Turbo program will terminate prematurely if the file doesn't exist.

■ Implementations of the C programming language (such as the Microsoft C Compiler, Version 3.00) often include access to the DOS environment.

Since the DOS environment is a concept lifted from the UNIX operating system, implementations of the C programming language (such as the Microsoft C Compiler, Version 3.00) often include access to the DOS environment without requiring the programmer to use features (such as Turbo's Memw array) that won't port to other compilers.—Charles Petzold

BROKEN UNDERLINING IN XYWRITE

Is there any easy way to get *XyWrite II Plus* to stop underlining the spaces between words in book titles and other italicized phrases? It seems that the only way to do this is to use the five-keystroke sequence Ctrl-1 Space bar Ctrl-3 between each word. Frankly, to this schoolteacher, that's more bother than staying with my older (admittedly slower) word processor.

Linda Stark
Montclair, New Jersey

Academics, both present and erstwhile, will insist on broken underlining, and Xy-

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Quest has long promised to add that more-or-less standard option of full-featured word processors. Until it does, however, to keep peace in the family I came up with a solution of my own.

Call up the keyboard definition file (called IBM.KBD) for editing and page through its various tables (TABLE=, TABLE=CTRL, TABLE=SHIFT, and so on) looking for the entry "57=". The number 57 is the scan code for the space bar, and in most cases there will simply be a single space to the right of the equals sign. (The exception is TABLE=CTRL, where in late copies of XyWrite II Plus *and in* XyWrite III *the entry is R3,R2. This sends the ASCII code 32, which creates a "hard," or nonbreaking, space.)*

In the TABLE=SHIFT and/or TABLE=ALT, change

```
57=[space]
```

to

```
57=m1,[space],m3
```

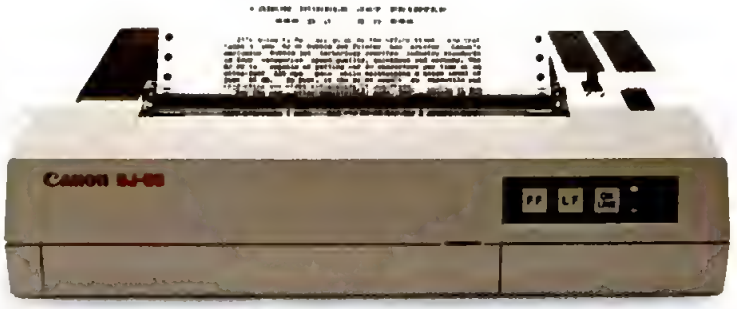
This way, if you hit Shift-Space bar or Alt-Space bar you will automatically reenter normal mode (m1), insert the space, and then return to underline mode (m3). An additional advantage of using this keyboard redefinition technique is that since there is almost always at least one space before you need to begin underlining a book title, for example, using the shifted space will automatically put you into the underlining mode without your having to initiate it by hitting Ctrl-3.

—Craig L. Stark

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The color/graphics (CGA) and enhanced graphics (EGA) adapters allow multiple text-mode display pages. These extra pages can be used from within your programs to perform "instant" screen updates. They can also be used from within DOS to store screen output you don't want to lose while running other programs.

In 80-column text modes, the CGA card gives you four screen pages numbered 0–3. Since nongraphics programs generally use only the active display page, anything stored on the other display pages will usually not be overwritten (although certain word processing programs may use more than one screen page).

However, there is no convenient way from within DOS to switch display pages. You can use the following SCRIPT1 file to create PAGE.COM. Type it in with a pure-ASCII word processor or by using the DOS COPY CON: command. Be sure to leave a blank line before RCX and hit the Enter key after each line, especially the last one:

```
A
MOV AL,[005D]
AND AL,4F
SUB AL,37
JNB 010B
ADD AL,37
MOV AH,05
INT 10
INT 20

RCX
11
N PAGE.COM
W
Q
```

```
100 ' PAGER.BAS
110 OPEN "COMMAND.COM" AS #1 LEN=1:FIELD #1,1 AS D$
120 FOR A=4284 TO 4286:GET 1,A:V$=V$+D$:NEXT:IF V$="3.1" THEN 140
130 PRINT "Retry with DOS 3.1 COMMAND.COM on this disk!":CLOSE:END
140 FOR A=1 TO 35:READ A$:LSET D$=CHR$(VAL("&B"+A$))
150 PUT #1,A+9516:NEXT:OPEN "PAGE.COM" AS #2 LEN=1:FIELD #2,1 AS D$
160 FOR A=1 TO 17:READ A$:LSET D$=CHR$(VAL("&H"+A$)):PUT #2:NEXT
170 CLOSE:PRINT "COMMAND.COM patched and PAGE.COM created":END
180 DATA B4,0F,CD,10,89,C1,B4,02,31,D2,CD,10,88,EA,FE,CA,B6,18
190 DATA 31,C9,B8,00,06,BB,00,07,CD,10,BB,00,00,B4,0B,CD,10
200 DATA A0,5D,00,24,4F,2C,37,73,02,04,37,B4,05,CD,10,CD,20
```

Figure 1: *PAGER.BAS program that both patches DOS 3.1 COMMAND.COM to correct its CLS command and creates the PAGE.COM utility to switch among text mode screen pages in DOS.*

Then type

```
DEBUG < SCRIPT1
```

to create the program. You invoke PAGE .COM at the DOS prompt by entering PAGE *n*, where *n* is the single-digit page number. For the CGA, *n* will be a number from 0 to 3 with 0 as the DOS default.

An additional problem is that if you start to use the extra display pages under DOS 3.*x*, you'll notice that the DOS command CLS does not work quite right. If you are in a display page other than page 0, CLS will blank the screen but place the cursor somewhere other than where it belongs in the upper-left-hand corner. While it is possible to write a short assembly language program to clear the screen in the way you'd like, a better solution may be to patch COMMAND.COM so that CLS does what it ought to.

To patch the DOS 3.1 version of COMMAND.COM, type in the following SCRIPT2 file. Again, be sure to leave a blank line near the end after the RET, and be sure to hit the Enter key after each line, especially the last one:

```
A 262C
MOV AH,0F
INT 10
MOV CX,AX
MOV AH,02
XOR DX,DX
INT 10
MOV DL,CH
DEC DL
MOV DH,18
XOR CX,CX
MOV AX,0600
MOV BX,0700
INT 10
MOV BX,0
MOV AH,0B
INT 10
RET

W
Q
```

Then, to repair your COMMAND.COM, type

```
DEBUG COMMAND.COM < SCRIPT2
```

Two recent User-to-User columns contained tips that you should consider adapting here. Calvin R. Shields in the November 26, 1985, issue (Volume 4 Number 24) pointed out that CLS clears one line too

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many and explained how to fix this, which is important if you are using the extra pages provided by PAGE.COM. And in the December 10, 1985, issue (Volume 4 Number 25), J. E. Lewis explained how to customize the CLS colors.

SCRIPT2 is for DOS 3.1 only. To incorporate the changes Lewis suggests, modify the two MOV BX,__instructions. For example, to have CLS produce bright yellow text on a blue background with a red border, change the

```
MOV BX,Ø7ØØ
```

instruction to

```
MOV BX,1EØØ
```

and change the

```
MOV BX,Ø
```

instruction to

```
MOV BX,ØØØ4
```

If you're using DOS 3.0, the only change that needs to be made is in the first line. The line

```
A 262C
```

should be changed to

```
A 2412
```

For earlier DOS versions, it appears from Figure 3 on page 307 of the December 10, 1985, issue that older CLS routines are 1 byte shorter. I do not know whether CLS works properly for DOS 2.*x*, but you can use nearly the same script to make the changes. First, replace the

```
MOV BX,Ø7ØØ
```

instruction with

```
MOV BH,Ø7
```

This is the instruction you would modify to change the foreground and background colors. To get bright yellow on a blue background as in the example above, change the 07 to 1E. Then, for DOS 2.0, change the A 262C to A 2331. For DOS 2.1, change it to A 2344.

Al Sato
College Station, Texas

It's really a tragedy that virtually no software manufacturers use the extra screen pages. You can use these yourself to store help information, notes, other directories, ASCII tables, etc. We wrote the PAGER.BAS program in Figure 1 to patch DOS 3.1 COMMAND.COM and create the PAGE.COM utility at the same time.

SNEAKY FILE SECURITY

While various programs on the market can encrypt DOS data files that contain sensitive information, there is one big limitation to all of them—the user must manually call up the program, specify which file to encrypt, and then enter some sort of password. And pity the poor soul who forgets that password!

Since many User-to-User readers write

```
10Ø 'HIDDEN.BAS -- Reads/writes "hidden" files -- by Ethan Winer
11Ø ' *** first, create "hidden" file
12Ø OPEN "NAMES" AS #1 LEN=8Ø
13Ø FIELD #1,22 AS NAM$,22 AS STREET$,22 AS CITY$,14 AS PHONE$
14Ø LSET NAM$ = "Access Denied"+CHR$(26):PUT #1
15Ø FOR X=1 TO 9
16Ø LSET NAM$    = "Smith, John"
17Ø LSET STREET$ = "129 East 14th St. #"+MKI$(X+48)
18Ø LSET CITY$   = "New York, N.Y. 1ØØ28"
19Ø LSET PHONE$  = "(212) 555-1212"
2ØØ PRINT "Writing record #";RIGHT$(STR$(X),1)
21Ø PUT #1:NEXT:CLOSE
22Ø ' *** show you can still read from "hidden" file
23Ø INPUT "Which record do you want to read (1-9): ",F$
24Ø IF VAL(F$)<1 OR VAL(F$)>9 THEN BEEP:GOTO 23Ø
25Ø OPEN "NAMES" AS #1 LEN=8Ø
26Ø FIELD #1,22 AS NAM$,22 AS STREET$,22 AS CITY$,14 AS PHONE$
27Ø GET #1,VAL(F$)+1
28Ø PRINT NAM$:PRINT STREET$:PRINT CITY$:PRINT PHONE$
29Ø CLOSE
```

Figure 2: *Program to create a file that is "hidden" from normal DOS TYPE, COPY filename PRN, or COPY filename CON commands. This program also demonstrates the ease of reading from such a file.*

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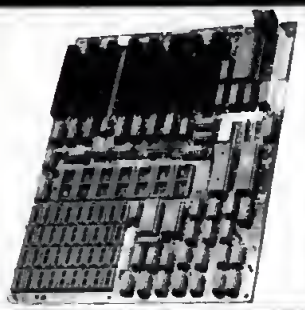
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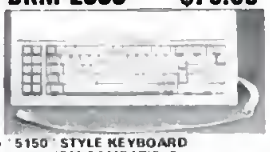
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■ USER-TO-USER

their own applications, it would make more sense to build the encryption directly into the program. One simple method would be to add 128 to the ASCII value of each character in the file, but that requires extra code every time the program reads or writes. Worse, it would be painfully slow when processing many records.

A better way is to write a Ctrl-Z at the beginning of the file—before any data is stored. This prevents unauthorized users from snooping with the TYPE command or using the COPY command to send the file to a printer or the screen. But it lets you copy the file to another disk. For a nonprogrammer, the only way to get at the data would be with a sector-reading utility like Peter Norton's.

The HIDDEN.BAS program in Figure 2 creates and reads a simple name-and-address file, while demonstrating the technique described. The only compromise is the space lost to the first record. Note that this method will also work when writing a sequential file; however, it must be read as a random file using the FIELD and GET statements.

■ One simple method of encryption would be to add 128 to the ASCII value of each character.

Ethan Winer
East Norwalk, Connecticut

Software manufacturers have been using a variation of this trick for years, putting a copyright notice or a screen full of text at the beginning of a .COM or .EXE file, followed immediately by a Ctrl-Z end-of-file marker. If users try to type the file, all they get is the message.

However, the trick in Figure 2 works only with naive users. The first thing any typical User-to-User reader would do on seeing an "Access Denied" message is look at the contents using DEBUG's (D)ump command. Or he would write a small program to read the file byte by byte

```
100 'random file reader
110 OPEN "NAMES" AS #1 LEN=1
120 FIELD 1,1 AS A$
130 FOR A=1 TO LOF(1)
140 GET 1,A:PRINT A$;
150 NEXT
```

Obviously, you should substitute the name of the file in question for NAMES in line 110. And you can speed things up considerably by increasing the LEN record length beyond one character.

Incidentally, while adding 128 (or any other value from 1 to 128) to each charac-

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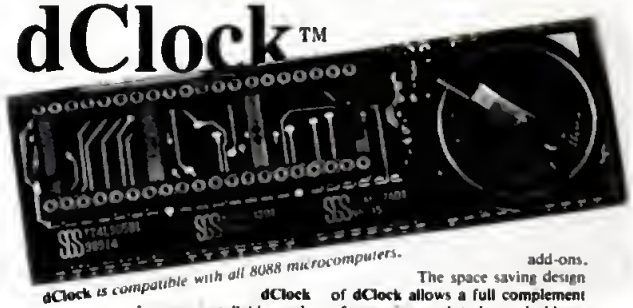
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ter in a file is a very unsophisticated security device, it will also keep casual snoopers away and is simple to do. To try this with the NAMES file created by the HIDDEN.BAS program in Figure 2, simply run the following program:

```
100 'trivial encryptor
110 OPEN "NAMES" AS #1 LEN=1
120 OPEN "NEWNAMES" AS #2 LEN=1
130 FIELD 1,1 AS A$
140 FIELD 2,1 AS B$
150 FOR A=1 TO LOF(1)
160 GET 1,A
170 LSET B$=CHR$(ASC(A$) XOR 128)
180 PUT #2,A
190 NEXT:CLOSE
```

(Be sure the NAMES file you created in the previous example is on the same disk as this trivial encryptor, or it won't have anything to encrypt.)

If a user types the contents of the NEWNAMES file, all he'll see is meaningless "high-bit" characters. To unscramble the NEWNAMES file, just run this program:

```
100 ' trivial decryptor
110 OPEN "NEWNAMES" AS #1 LEN=1
120 FIELD 1,1 AS A$
130 FOR A=1 TO LOF(1)
140 GET 1,A
150 PRINT CHR$(ASC(A$) XOR 128);
160 NEXT:CLOSE
```

Instead of using the 128 in the two previous programs, you can substitute any number from 1 to 127, but make sure you do it in both the encryptor and decryptor programs. It's easy to beat such a trivial transposition encryption scheme. To do so, just look at the contents with the DOS TYPE or DEBUG Dump commands. Random access files pad out unused fields with space characters (CHR$(32)). The encryptor file above will uniformly change them to something else. In this example, it will be an a with a dot over it (CHR$(160), since 32 + 128 = 160). It's easy to see these characters padding out fields of different sizes. Once you find the "encrypted" space character, subtract 32 from it and XOR all the characters with the value of the difference.

SECURITY LEAKS

A friend of mine routinely stored very sensitive correspondence on his hard disk. He used the encryption feature of *SuperKey* to "keep it safe" but asked me to check his safety measures—and the results were enlightening.

My friend uses a well-known word processor that produces .BAK files with each new or changed document; he then erases the .BAK files. But after 2 minutes with *The Norton Utilities*, I was able to unerase these unprotected backup files. Now my friend either uses Norton's FileWipe program to completely erase backup files or encrypts them before erasing.

However, in addition to the visible .BAK files, this particular word processor produced several working files (with .$$$ and .@@@ extensions). Therefore my

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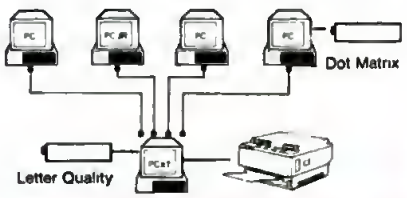
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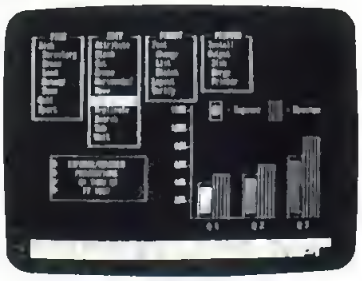
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■ USER-TO-USER

friend has to use *The Norton Utilities* to unerase the working files and then FileWipe or encrypt them.

The moral is that just encrypting the working file is not enough. Make sure all copies of the file are either encrypted or erased with a program that will prevent them from being recovered.

Here are two other simple batch tips: First, since I hate having to type colons when using the DOS COPY or DIR commands, I've written batch files with replaceable parameters that do all the work for me. To see what's on A: I use DIRA .BAT, which contains the single line

```
DIR A:%1 %2 %3
```

To copy files from drive B: I use COPYB.BAT, which contains the single line

```
COPY B:%1 %2 %3
```

Ronny Richardson
Chamblee, Georgia

Good point. The insidious thing about the working files you mentioned is that most users never see them since the word processor writes them to the disk during a work session and then "erases" them before the program exits. If you've ever crashed out WordStar *with a "Disk Full" error, you might see the .$$$ temporary file, but under normal circumstances you don't. Incidentally, while* SuperKey *and* The Norton Utilities *are two of the best out there,* PC Magazine *has published its own encryptor and file obliterator (as well as a file recovery tool)—see the Programming column in* PC Magazine, *Volume 4 Number 18 and the Programming/Utilities column in Volume 4 Number 21. All the %1 %2 %3 replaceable parameters aren't really needed when doing a directory search. A single %1 will handle just about anything you can throw at it. For copying, all three can come in handy.*

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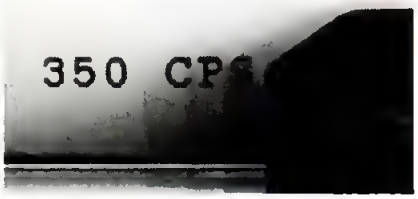
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CIRCLE 181 ON READER SERVICE CARD

■ EDITED BY CHARLES PETZOLD

PC TUTOR



The PC Tutor answers your questions on everything from programming and operating systems to hardware and applications software.

SCREEN PAGES IN BASIC

I have read articles that mention the SCREEN function in BASIC, but it is not clear to me how to use it. I've been trying to flip quickly between various menus on the screen so that a user response could activate different screens from subroutines, but without much success. I would also like to use this in graphics to display various pictures on the screen in order to simulate the operation of our electrical control products.

Ken Leduc
Brantford, Ontario
Canada

Of the two applications you mention, the first is fairly easy, provided you have a Color/Graphics Adapter. If you have the Monochrome Adapter (or anticipate that the program will run on the Monochrome Adapter), then you can't do it because the Monochrome Adapter can store only one screen of video.

When using the Color/Graphics Adapter in 80-column text mode, you can store four video pages. (In 40-column text mode, you can store eight pages.) Only one page is visible at a time, but you can write to the other three (or seven) pages and then quickly flip to them later. The SCREEN command is used to select both which video page you want to write to and which page you want to have displayed.

SCREEN takes four parameters. In text mode, the first parameter is a 0. The second parameter is a 1 to enable color. (You'll probably use 0 to disable color only if you use a black-and-white display driven through the composite output jack of the display adapter.) The third parameter selects which of the four (or eight) pages subsequent screen output statements will write to. The fourth parameter determines which of these four (or eight) pages is displayed. The pages are numbered 0, 1, 2, and 3 (or up to 7 with a 40-column display).

Figure 1 shows a small BASIC program that demonstrates this. Lines 10 and 20 write one line on each of the four pages while continuing to display page 0. Line 40 writes another line on page 0. By pressing the 0, 1, 2, or 3 keys, you can see the other three pages.

Note that BASIC does not maintain a different cursor for each of the pages. Each of the text lines in this little demonstration program is spaced a line lower, just as if they were all written to the same page. You have to handle the cursor problem yourself when using video pages. You can get the current cursor position with the POS and CSRLIN functions and set it with LOCATE.

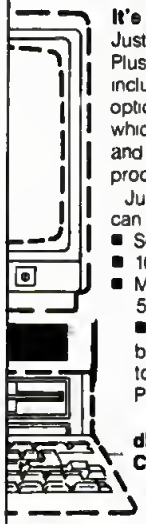
Graphics present a whole different story. The Color/Graphics Adapter has only enough memory for one video page when using either the 320-dot by 200-line four-color graphics mode or the 640-dot by 200-line two-color graphics mode. BASIC has various built-in commands to work with graphics and to perform some crude animation, so you might consider programming a simulated operation of your products rather than flip different images to the screen. The BASIC commands BSAVE and BLOAD can, respectively, save a graphics screen image to a disk file and retrieve it, but I suspect the speed of these commands, even in a compiled BASIC program, will be unsatisfactory. (IBM's Enhanced Graphics Adapter can store multiple graphics pages, but BASIC does not yet support it.)

One compromise that may prove easier to use for your purpose may be to use what are often called "Character Graphics." In character mode, you have access to a variety of lines, blocks, and other graphics symbols that can often be successfully combined to make effective and easily manipulated 16-color drawings. The avail-

```
10 CLS : FOR P = 0 TO 3 : SCREEN 0,1,P,0
20   PRINT "This is Page";P : NEXT P
30 SCREEN 0,1,0,0
40 PRINT "Press 0 through 3 to see the pages"
50 K$ = INKEY$ : IF K$ = "" GOTO 50
60 IF K$=>"0" AND K$<"4" THEN SCREEN 0,1,0,VAL(K$)
70 GOTO 50
```

Figure 1: *A small BASIC program that demonstrates use of the SCREEN command to write on four video pages. It then uses keyboard input to select which of the four pages is displayed. This program will not work with the Monochrome Adapter.*

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■ PC TUTOR

able graphics symbols are shown in Appendix G of the BASIC 2.0 manual and Appendix D of the BASIC 3.0 manual. For an example of the variety of images that you can make using these characters, take a look at IBM's monochrome display version of the "Introduction to the IBM PC" disk.

UPGRADING YOUR DOS

I recently acquired a hard disk and am in the process of learning the various directory management methods. Since I acquired my first IBM PC, I have always used DOS 2.0. Are there any good reasons for (and any possible problems with) upgrading from DOS 2.0 to 3.1?

Richard B. Cawthorne
Summit, New Jersey

At this writing, PC-DOS 3.1 is the most recent version for the IBM PC. Generally it's a good idea, although not entirely necessary, to keep pace with the most recent DOS releases. For the most part, DOS versions are upwardly compatible: Programs written for an earlier DOS version almost always run under later DOS versions. (The exceptions, which were significant back in the days when DOS 2.0 came out, often resulted from clumsy copy-protection schemes or dumb programming practices.)

Ostensibly, PC-DOS upgrades have been released to support hardware changes and additional members to the PC family, as shown below:

PC-DOS 1.1: Double-sided diskettes
2.0: PC-XT and hard disk
2.1: PCjr
3.0: PC AT
3.1: IBM Network

Version 2.0 represented a major step over 1.1, since it introduced support of subdirectory disk organization. Version 2.1 fixed some bugs in 2.0 besides supporting the PCjr. Version 3.0 was not as great an advance as 2.0 was, but it added a few commands such as ATTRIB (which can mark files as Read-Only to protect them from changes) and LABEL, which changes the volume label on a disk. DOS 3.0 also included a RAMdisk program called VDISK. PC-DOS 3.1 fixes some of the buggy parts of 3.0. The new commands in PC-DOS 3.1 are SUBST, which can define a new drive letter to refer to a subdirectory, and JOIN, which can make one disk drive appear as a subdirectory of another disk drive.

When a new DOS version comes out, you'll find also that many of the User-to-User suggestions in PC Magazine *consist of things people have discovered about the new DOS. Being able to try these out is one reason to keep current. Some of the new capabilities may be entirely useless to you; others may be perfect for solving a problem you've been having.*

By way of example, the DOS 3.1 SUBST command proved to be a real blessing to WordStar *users, for it allowed us to refer to directories by new disk letters. While* WordStar *knows nothing about subdirectories, it can easily recognize new disk letters and so works fine with SUBST.*

■ While *WordStar* knows nothing about subdirectories, it can easily recognize new disk letters, and so works fine with the DOS 3.1 SUBST command.

The change in the TREE command that lets it list files in the root directory is another illustration of something that hadn't worked right since DOS 2.0 and was finally fixed in DOS 3.1.

Upgrading a hard disk to a new DOS version is no big deal. If you're concerned that some of your existing programs may not run under DOS 3.1, you can experiment with DOS 3.1 before installing it on your hard disk. To do this, instead of booting from the hard disk (as you probably do now), just put a copy of the DOS 3.1 system disk (including your CONFIG.SYS and AUTOEXEC.BAT files) in drive A: and boot from that. Try using your PC with the new DOS for a few days or weeks until

you satisfy yourself that all is well. (If you have a PATH that points to a directory where the DOS programs are located, you should change that part of the PATH to point to drive A:.) Until you have completed your changeover, a few DOS 2.0 programs (such as CHKDSK and TREE) will give you an "Incorrect DOS Version" message under DOS 3.1. Most (like EDLIN and DEBUG) will run fine.

When you've satisfied yourself that everything works under the new DOS version, installing the new DOS on the hard disk is a fairly simple process. You do not *need to use FDISK or FORMAT again. Instead, use the SYS command, which transfers DOS to a disk that has already been formatted with room for the operating system. After you've booted from drive A: with the new DOS version and ensured that your current drive is A: (just look at the prompt letter), enter the following three commands:*

```
SYS C:
COPY COMMAND.COM C:\
COPY *.* C:\DOS
```

The last line above assumes you keep the programs included with DOS in a directory called DOS. You could alternatively just copy them to C:\ if you keep them in the root directory. Or you could create a directory called DOS for this purpose:

```
MD C:\DOS
```

After you're done, you'll be able to boot the new DOS version from the hard disk.

DUMPING GRAPHICS

For demonstration purposes in class, I use a PC and a simulation program written in Pascal to display plots on a high-resolution graphics display. I have been unable, however, to do a screen dump to my Epson printer. What have I failed to do?

Sanford R. Silverburg
Salisbury, North Carolina

That depends. I assume you're trying to dump the screen with the Shift-PrtSc key. You didn't say which *high-resolution graphics adapter you use, but if it's the IBM Color/Graphics Adapter (or a compatible), then the only thing you've forgotten to do is to load the PC-DOS GRAPHICS.COM program first.*

The Print Screen routine coded in the ROM BIOS works only with characters. If the display is in a graphics mode, it will only print characters that it can recognize but will not translate the graphics. This is a reasonable restriction, since graphics protocols for printers vary widely and the ROM BIOS surely cannot be expected to support them all.

The PC-DOS GRAPHICS.COM program supplements the ROM BIOS Print Screen routines. GRAPHICS.COM remains resident in memory, so you only need load it once during your PC session. (I have my AUTOEXEC.BAT file load it.) It prints 320 × 200 four-color graphics (video modes 4 and 5), and 640 × 200 black-and-white graphics (video mode 6) to an IBM Graphics Printer or compatible. Since we all know what the Graphics Printer was before IBM put its own label on it, you can be sure that the program will also work with Epsons. GRAPHICS.COM uses different dot densities for the four colors of the 320 × 200 mode to simulate color. The DOS 3.0 and 3.1 versions of GRAPHICS also support the IBM Color Printer (with black, RGB, or CMY ribbons) and the IBM Compact Printer.

One would expect GRAPHICS.COM to support the additional video modes of the IBM Enhanced Graphics Adapter (EGA), but it does not. Since IBM didn't bother to add the PCjr video modes to GRAPHICS when the machine was being manufactured, I would not look for future support.

If you're not using the IBM Color/Graphics Adapter or equivalent, then you have a problem. You could write your own resident graphics print screen utility for the adapter or, in your particular case, you might want to add a screen dump routine to the Pascal program itself.

Graphics screen dump programs are generally considered printer utilities rather than screen utilities. People who have a non-IBM or non-Epson–compatible printer might check the "Print Utilities" section of the Ziff-Davis PC Buyers Guide *for any available programs for their printers.*

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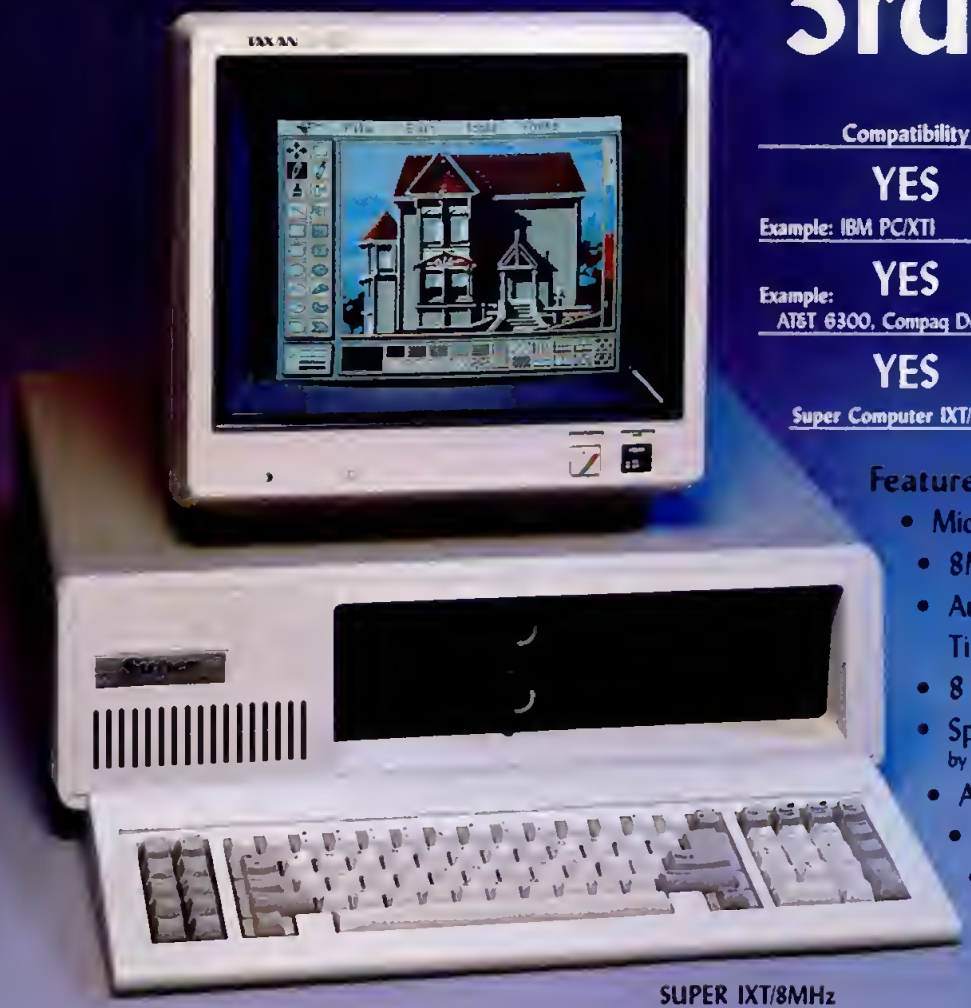
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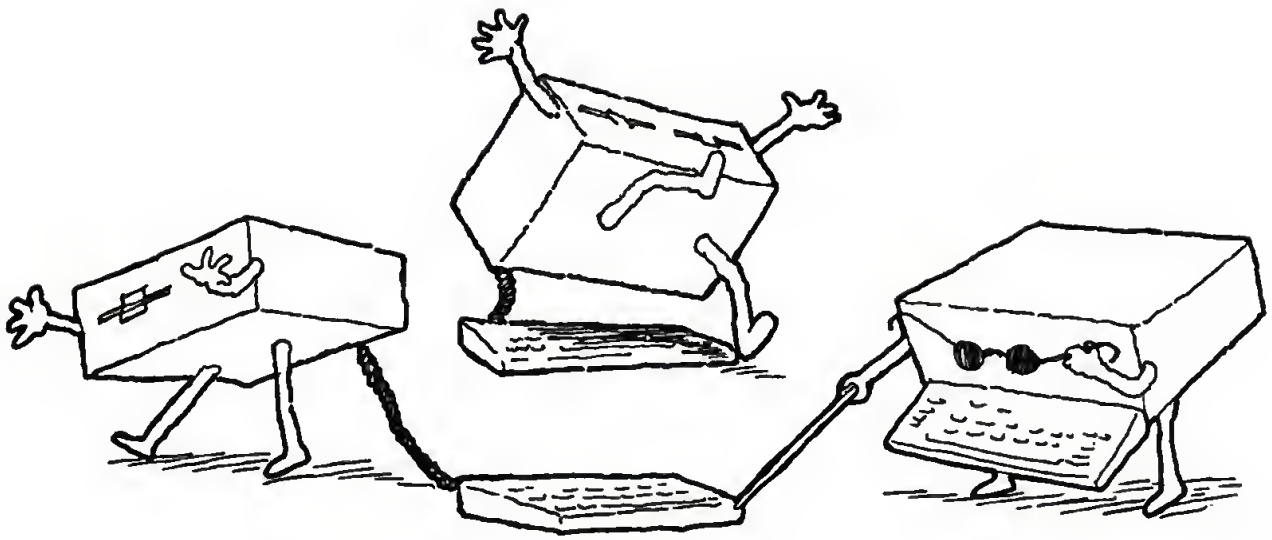
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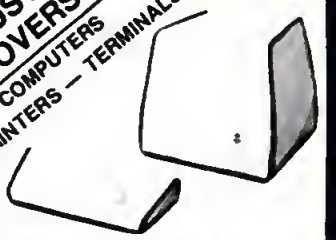
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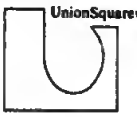
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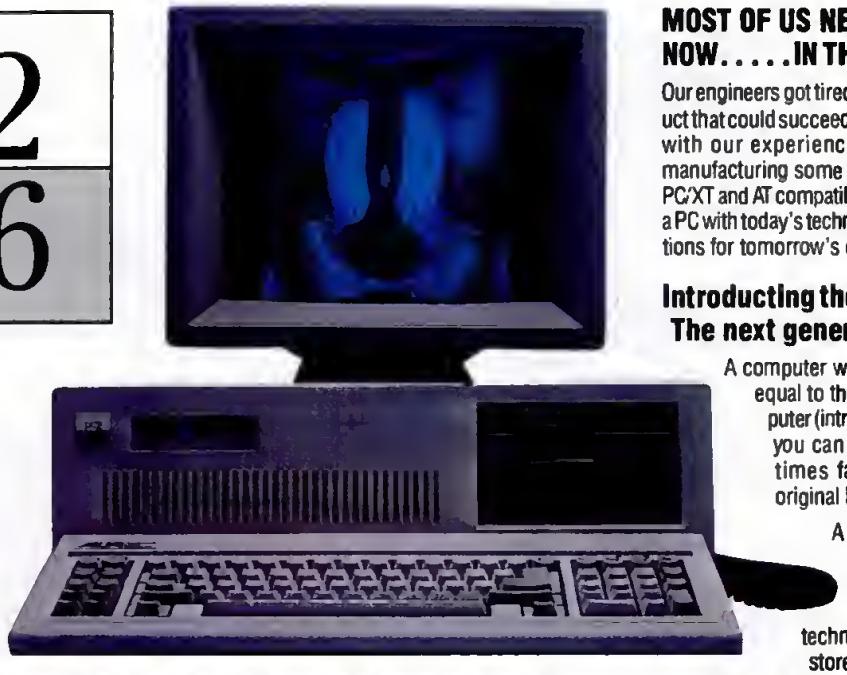
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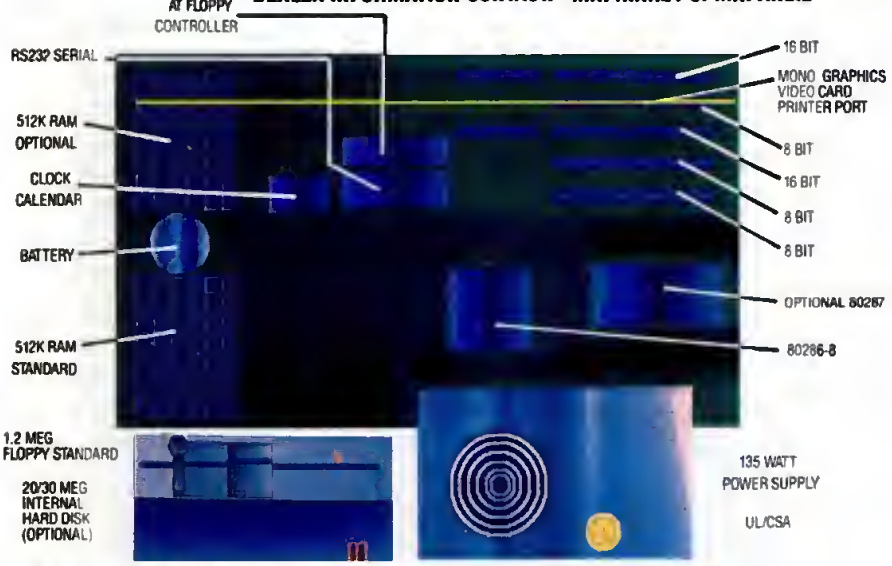
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PC MAGAZINE REVIEWS IN BRIEF

SQL*Calc: The Data Connection

BY ALFRED POOR

When do you use a spreadsheet, and when do you use a database management system? There are probably times when you can't make up your mind. Huge spreadsheets are unwieldy at best, yet a database program cannot play the what-if analysis games fast enough. Sure, there are integrated packages that do both, but often you pay too high a price in terms of reduced features in the spreadsheet or database functions.

If you are working with large files downloaded from mainframes, the problems are aggravated by the large quantities of data that you must sift through. Wouldn't it be nice to have a spreadsheet with enough smarts that you could tell it to "go out and get the sales figures for the eastern region for the last quarter of each of the past 3 years" and just load them into a spreadsheet for you to analyze?

*SQL*Calc* can do that—and more.

*SQL*Calc* is a spreadsheet program that provides most of the standard spreadsheet functions that we have come to expect: split-screen windows, variable column widths, titles, named ranges, different formats for numeric values, and text labels that "spill over" into empty adjacent cells.

*SQL*Calc* lets you log on to the *Oracle* database program, where you can call up one or more tables of data and issue query commands using SQL (pronounced "sequel"), the relational data language used in many mainframe and micro programs. The data is then automatically loaded directly into your spreadsheet, filling a cell or range of cells according to your specifications. You can choose to select only certain fields (columns) from your table and can also specify criteria to be used in selecting which records are used. You can even sort the records as they are brought into the spreadsheet.

If your selection takes up more or fewer lines than you have set aside in your spreadsheet, *SQL*Calc* will ask whether you want to insert new rows or delete the excess. If you know in advance what the answer will be, you

Add-on 1-2-3 Utilities Remember Your Macros

BY GLENN HART

As *1-2-3* diehards have found, it's easy to fill *1-2-3* cells with cryptic formulas and macros. Days and weeks later, it can be nearly impossible to remember how the cell contents were derived or how to decipher a macro.

If you find these kinds of scenarios haunting your number-crunching days and nights, then *Note-It* and *Quickcode*, two *1-2-3* add-on utilities, are designed to help.

Note-It uses two forms of explanatory notes to aid in documenting spreadsheets. With "cell notes," you can attach a note to an individual cell location, while "file notes" are used to attach a note to any *1-2-3* filename to identify the contents of that file.

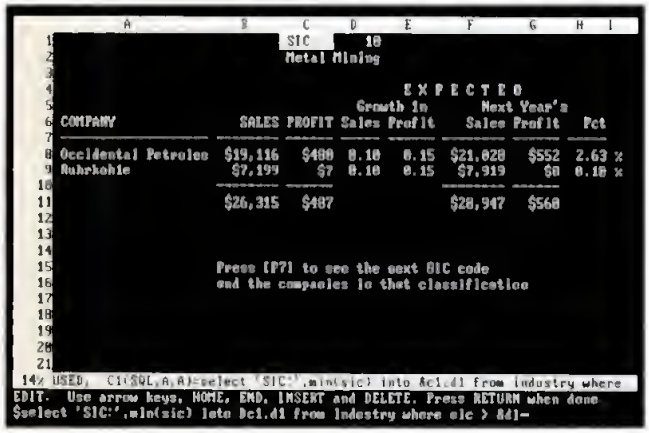
Both types of notes are useful. Cell notes are lifesavers in that they let you enter a short comment along with each formula and macro. The file note system helps you work around the short filenames permitted by DOS so that you can easily locate desired files.

Using *Note-It* is simple. A special worksheet is combined with the current sheet in an out-of-the-way location. Entering, editing, and printing the documenting notes is self-explanatory and fast. *Note-It* is called up by using normally unused keystroke combinations. A text editor with *WordStar*-compatible commands as well as search and file-manipulation commands is provided.

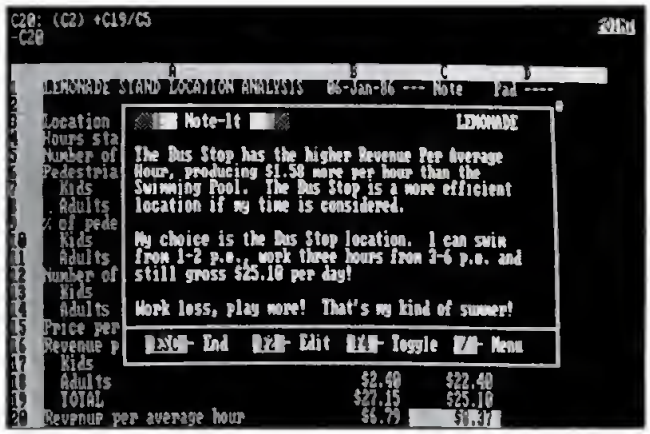
Note-It works with *1-2-3* (Versions 1, 1A, and 2) and can even use expanded memory (beyond 640K bytes) if available. The program works beautifully and is a valuable addition to the *1-2-3* power user's arsenal.

Quickcode is a powerful add-on to *1-2-3*. It offers many functions that are useful to beginners, advanced *1-2-3* power users, and even software developers.

You access *Quickcode*'s features with control codes, a convenient choice since *1-2-3* normally doesn't use them. The user interface



The statement at the bottom of this screen illustrates the power of the SQL language. It is part of a circular reference that extracts different sets of records in turn.



Note-It, from Turner Hall Publishing, is a $79.95 1-2-3 add-on that lets you document cells and macros in 1-2-3 by attaching explanatory notes to them.

SQL*CALC

(continued)

can set up the query definition to make these adjustments automatically.

As an example of this feature's power, *Oracle* provided a set of demo files containing SIC categories, basic data on major corporations including earnings, number of employees, and SIC code. On a spreadsheet, these files are linked to produce a series of reports that show the current data and make financial projections for each company, organized by type of industry. You view the projections for each group by pressing the Recalculate key. Instead of one monster spreadsheet, you are working with a series of one-page sheets that are faster and more manageable.

There are trade-offs: the system is a memory hog. While the lower-right cell is defined as IV8192, I found that on a 512K-byte machine I couldn't fill much more than a 6 by 75 block. This range of cells took 11 seconds to recalculate, so the program is no speed demon, either. (Lotus's *1-2-3* performs the same task in just over 2 seconds.) Scrolling and screen refreshing are similarly slow.

You can call up a list of spreadsheets stored on disk, but you must still type in the name of the one you want (unlike programs that let you highlight the one you want to select). There is a thorough installation batch file that does everything from creating the required subdirectories to copying program and data files (including a start-up batch file in the root directory). The problem is that it sends all the uutput from the installation program to the NUL device: while this procedure keeps the screen nice and clean, it prevented the program from telling me that I had run out of disk space. As a result, it took me quite a while to figure out just why the program would not run properly.

Overall, this looks like a product with real promise for certain settings. If you need to work with large amounts of data that are readily available from mainframe or other database sources, this could be a tremendous tool for automating the analysis and review of the information. Its lack of speed on recalculating diminishes in significance when you apply it to small sheets with relatively few calculations. Its faults nearly disappear when compared to the time you may save by not having to frequently recalculate (or rekey) all the information in a massive data table. ■

PC MAGAZINE FACT FILE

***SQL*Calc*, Version 1.0**
Oracle Corp.
20 Davis Dr.
Belmont, CA 94002
List Price: $395 for licensed *Oracle* users; $995, with the basic *Oracle* database program (does not include report writer or full-screen data-entry modules for *Oracle*)
Requires: 512K RAM, hard disk, DOS 2.0 or later.
In Short: A modeling program that provides most standard spreadsheet functions at a higher-than-expected memory cost. Copy protected.

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Add-on 1-2-3

(continued)

is identical in style to *1-2-3*'s and is elegant and extremely easy to learn and use.

Quickcode simplifies the use of macros. It records keystrokes for replay or entry into a worksheet. Macros can be stored in a library for use with other worksheets. Pop-up windows and color are used to good effect.

Quickcode includes a straightforward, structured language called PL/123 that is

much easier to use than *1-2-3*'s macro language. The language includes modern control structures, loops, and program segmentation statements. Custom menu structures that look and work just like *1-2-3*'s can be easily constructed.

A pop-up editing window is used to write PL/123 programs. It includes a simple line editor that is sufficient for the task at hand. *Quickcode* compiles PL/123 source code directly into *1-2-3* macro language and includes a very good debugger.

Quickcode also greatly expands use of *1-2-3* as a database system. Users define their data field structure, and then *Quickcode* generates eight powerful macro programs in a few seconds. Several hundred cells of macro code are created to implement a fairly complete data management structure. The *Quickcode* database system isn't equal to a complex *dBASE* program suite but is far better than what is normally possible with *1-2-3*.

Quickcode's documentation is very clearly written, comprehensive, and well produced. *Quickcode* requires Version 2.0 of *1-2-3*. Version 1A owners can buy Fox & Geller's *Keymac* or *Quickmac*, which offer many of the features available in *Quickcode*. A passkey security system is also available.

Fox & Geller has long been known for its enhancement products for *dBASE*. Its initial *1-2-3* add-on software is truly impressive. ■

PC MAGAZINE FACT FILE

Note-It
Turner Hall Publishing
10201 Torre Ave.
Cupertino, CA 95014
(408) 253-9607
List Price: $79.95
Requires: 70K RAM, *1-2-3* (Versions 1, 1A, or 2.0).
In Short: Adds comments to *1-2-3* worksheets and individual cells. A painless method of documenting macros and formulas. Not copy protected.

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Quickcode
Fox & Geller Inc.
604 Market St.
Elmwood Park, NJ 07407
(201) 794-8883
List Price: $199
Requires: 384K RAM, *1-2-3* (Version 2.0).
In Short: A superb *1-2-3* add-on that simplifies macro use, provides a structured programming language, and greatly expands *1-2-3*'s database management capabilities. Copy protected.

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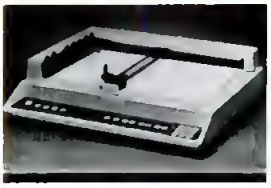
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CIRCLE 266 ON READER SERVICE CARD

Enigma Keys Up with 40 Function Keys and More

BY GLENN HART

Judging from the number of third-party keyboards available, many PC users want more keys, special features, and a different feel from what the standard IBM keyboards give them. A good example is the Enigma 9000 Keyboard in versions for the IBM PC or AT (the two differ only by a ROM chip).

There are lots of extra keys on the Enigma 9000: 133 to the standard PC's 83. Several keys have been relocated and enlarged. The Enigma has 40 function keys instead of the normal 10. Running across the top of the keyboard are four banks of 10 function keys: F1 to F10, F1 to F10 shifted, Ctrl-F1 to Ctrl-F10, and Alt-F1 to Alt-F10. With the included *SmartKey* keyboard enhancer, each key can have a second meaning, for a total of 80 functions. To keep track of all the functions, there's a plastic keyboard template with pressure-sensitive labels.

A separate cursor pad adds a Pause and Print key as well as one extra of each of these keys: Return, Shift, Alt, Ctrl, Space bar, Comma, Slash, and Equal sign. The Esc key is above Tab (where God meant it to be) instead of the peculiar position on the AT. Many keys are much larger and easier to hit than on the IBM keyboards. The CapsLock, NumLock, ScrollLock, and PrtSc toggle keys have LED indicators.

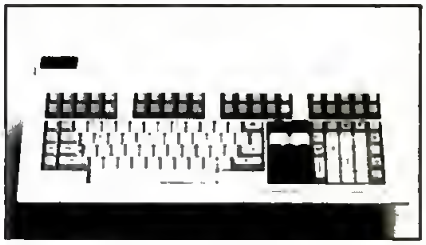
Satisfaction with a keyboard depends on the combination of keys supplied, their location, and, perhaps most important in the long run, that elusive attribute called "feel." Keyboard feel on the Enigma is very different from that on standard IBM keyboards. The Enigma uses solid-state capacitive switches with positive tactile feedback. It is much less "clicky" and requires less key depression. Unlike many third-party keyboards, the Enigma is not mushy and vague. Feedback to the operator is positive and unambiguous.

There are many third-party keyboards or auxiliary keypads available that include separate cursor pads, touchpads to emulate mice, trackballs, and even speech recognition. The Enigma 9000 stands out for its excellent feel, profusion of convenient extra keys, and solid construction. IBM's keyboards are good; in my view, the Enigma is better. ■

PC MAGAZINE FACT FILE

Enigma 9000 Keyboard
Enigma Research
4534 Vista del Monte, #A104
Sherman Oaks, CA 91403
(818) 784-0343
List Price: $350, including *SmartKey* software
In Short: A keyboard with excellent performance and 40 function keys instead of the usual 10. Available in PC and AT versions.

CIRCLE 609 ON READER SERVICE CARD



The Enigma 9000 Keyboard, $350 in PC and AT versions, strips 40 function keys in four banks of 10 across the top of the keyboard. It sports 133 keys, including a separate cursor pad, and has an excellent feel.

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CIRCLE 115 ON READER SERVICE CARD

Datran Add-in Compacts Text For File Transfer By Modem

BY M. DAVID STONE

The Datran Modem Accelerator multifunction board is at least twice misnamed. Actually, it's a data compression board—a $495 trash compactor for text. It's a modem accelerator only in the sense that shorter files take less time to send; the modem itself doesn't run any faster.

Nor is this a multifunction board in the way something like an AST SixPak is. The functions are text compression and decompression, rudimentary spelling checking, and data encryption. Perhaps this "modem accelerator" is better thought of as a text-handling board.

In PC Magazine Labs tests, compression and decompression times ranged from 8 seconds for a 2.3K-byte file to 34 seconds for a 34K-byte file. The file size for compressed files ranged between 36 and 45 percent of the originals. (Datran claims compression to 33 percent.) The Datran Modem Accelerator handles *WordStar*, *WordPerfect*, and straight ASCII files. Compatibility with other word processors is in the offing.

The functions are handled by Datran's proprietary Symbolic Tokenizer, a custom language processor that can read a file and compare it with the 28,000 words and 3,000 phrases in an on-board ROM-based dictionary. The board itself fits into a full-length slot. It's accompanied by a nonprotected software disk.

When compressing text, all matches are converted to binary tokens, and the system writes the compressed binary file to disk. When decompressing text, the process reverses. The range in compression in our tests reflects the degree to which a given file matched the vocabulary in the ROM-based dictionary.

Compression and modem file transfer are separate steps. Datran is reportedly at work on a version that would handle compression during file transmission.

The rudimentary spelling checker marks every word that doesn't appear in the program's modest 28,000-word dictionary. You're on your own for making corrections, so keep your *Webster's* handy. The spell check feature is more a demonstration of technology—and simple technology at that—than it is a practical tool.

The Datran board is not a product that everyone can make good use of. But it is worth looking at if you need the data-compression feature for storing text or for minimizing data transfer time between two Datran-equipped computers. PC

PC MAGAZINE FACT FILE

Datran Modem Accelerator
Datran Corp.
10519 Lauriston Ave.
Los Angeles, CA 90064
(213) 474-3684
List Price: $495
Requires: 128K RAM.
In Short: This data compression board has nothing to do with modems, but it is an effective way to compress text files to less than half their original size. For modem transfers, you need one at each end.

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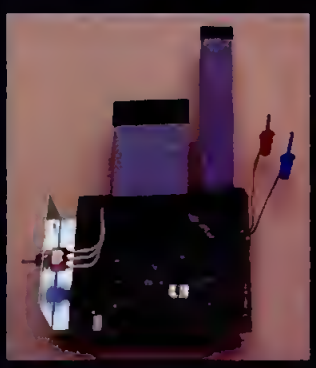
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PC MAGAZINE

COMING UP

SPECIAL BLOCKBUSTER ISSUE: PROJECT DATABASE II Project Database II, a series of productivity-oriented reviews that will span three issues, is the largest, most comprehensive report on database management programs since *PC Magazine*'s mammoth coverage of industry offerings in 1984.

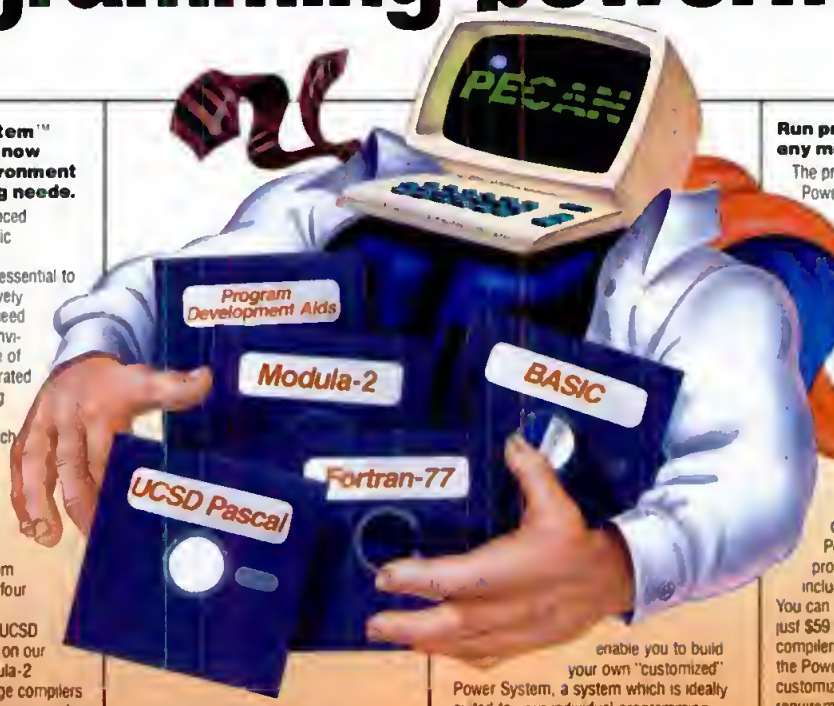
The editors have selected and analyzed over 100 database management programs, dividing them into three feature-oriented categories: flat-file databases, relational databases, and programmable relational databases. Thirty reviewers worked against the clock in the PC Magazine Labs to thoroughly test each database's speed and features. In addition, we've reviewed some programs designed to meet more-specialized needs: database language compilers, text-based database managers, and mailing-list managers.

Issue 12 kicks off Project Database II with reviews of 56 relational databases with and without programming capabilities. Flat-file database management programs will be thoroughly covered in the two issues that follow.

A FREE MEMORY-RESIDENT PRINTER UTILITY The June 24 Programming/Utilities column will contain one of the most useful do-it-yourself assembly language programs we've ever seen. SETUP.COM, by professional programmer Jeff Prosise, offers a 'smorgasbord of printer control options for the Epson FX and RX printers that you can access, at the touch of two keys, without disturbing the program you're working in. This utility lets you set up your printer quickly and easily for such features as compressed text and elite type and can be adapted for any other printer.

VIEWPOINTS COLUMNS Peter Norton on hard disk partitioning, Jim Seymour on the importance of speed, Stephen Manes on the failure of low technology, and Stewart Alsop on the universal truths of selling software.

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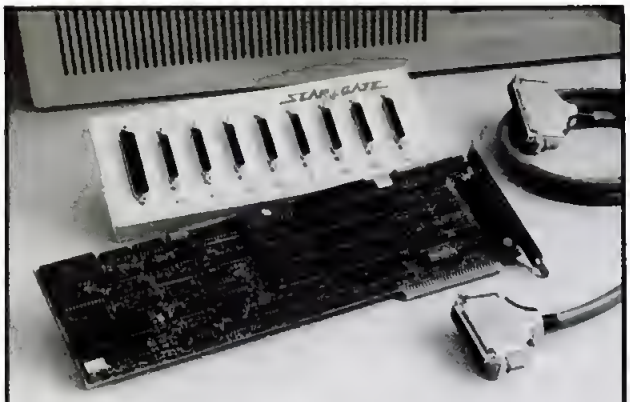
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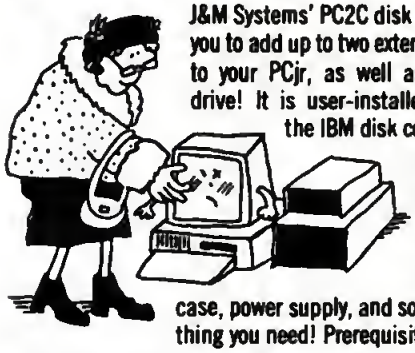
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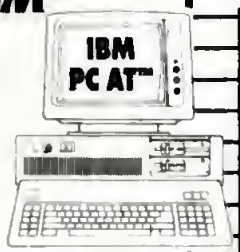
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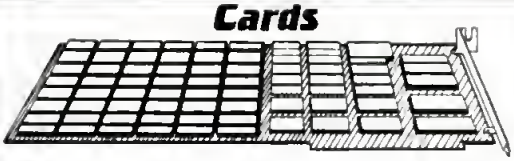


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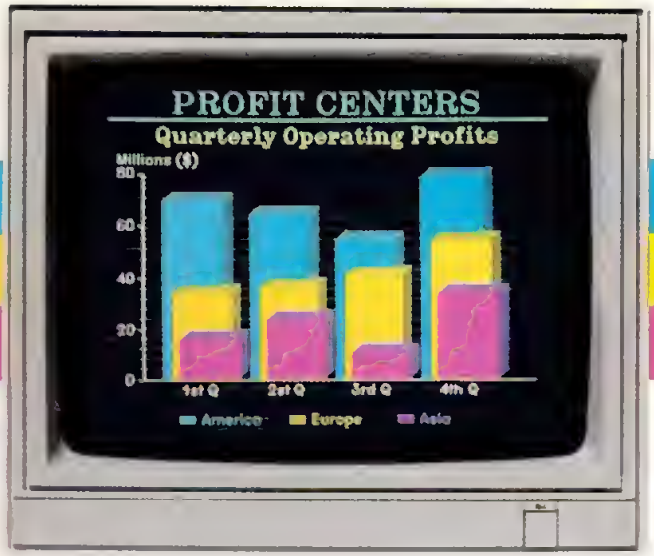
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The new PS-1 Universal Printer Stand from Curtis holds any printer, standard carriage or wide, saves valuable work-space, and costs only $19.95. The PS-1 uses no more desk-top space than the printer itself, and provides storage for input paper underneath the printer. Plus, a removable paper tray automatically stacks output.

Besides saving space, the PS-1 holds the printer at a slight pitch, to improve line of sight, saving you neck and eye strain. Give yourself more room to work, and a system setup that's more efficient and organized: The PS-1 Universal Printer Stand from Curtis — the experts in accessories. #PS-1 Retail...$19.95

Curtis products are available nationally from leading Dealers, Distributors, and Retail Chains.

In Canada. Micro-Computer Products. P.O. Box 235, Ajax, ONT, Canada L1S 3C3, (416) 427-6612

For the Curtis dealer nearest you call (603) 924-3823

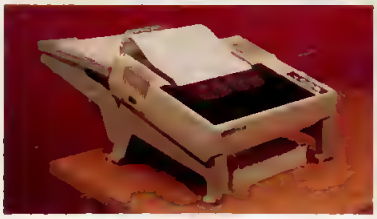
Fits all printers, standard carriage or wide.





Improves line of sight for portable computers too!

Conveniently stores paper underneath, improves line of sight to printout, removable paper tray catches and folds printouts automatically.





Totally universal. Heavily constructed components, colored and textured to match or complement all microcomputer systems.